MEMOIRS OF THE GEOLOGICAL SURVEY.

ENGLAND AND WALES.

THE GEOLOGY

OF

THE COUNTRY BETWEEN

ATHERSTONE AND CHARNWOOD FOREST.

(Explanation of Sheet 155.)

BY

C. FOX-STRANGWAYS, F.G.S.

WITH

Notes on Charnwood Forest by

Prof. W. W. Watts, M.A., F.G.S.

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MIDDLESEX†,—1† NW, SW, 7*, 8†.
MONMOUTHSHIRE,—35, 36, 42 SE, NE, 43 SW.
MONTGOMERYSHIRE†,—56 NW, 59 NE, SE, 60, 74 SW, SE.
NORFOLK†,—50 NW*, NE*, 64*, 65*, 66*, 67*, 68*, 69.
NORTHAMPTONSHIRE,—64*, 45 NW, NE, 46 NW, 52 NW NE, SW, 53 NE, SW, & SE, 63 SE, 64.
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STAFFORDSHIRE*,—54 NW, 55 NE, 61 NE, SE, 62, 63 NW, 71 SW, 72, 73 NE, SE, 81 SE, SW.
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WORCESTERSHIRE,—43 NE, 44*, 54, 55, 62 SW, SE, 61 SE.
YORKSHIRE†,—85-88, 91 NE, SE 92-97* 98 NE* SE*, 101 NE SE, 103 SW, SE, 104.

See also *New Series* Maps.

PLATE I.

HANGING ROCKS, WOODHOUSE EAVES.
CRAG OF WOODHOUSE BEDS, SHEWING BEDDING AND CLEAVAGE IN HORNSTONES.
From a Photograph by Dr F J Allen.

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PREFACE.

THE ground described in the present Memoir is contained in Sheet 155 of the New Series of the one-inch-scale map of England, and embraces the western part of Leicestershire, with adjacent portions of Warwickshire, Staffordshire, and Derbyshire. It nearly coincides with the area represented in Sheet 63 N.W. of the Old Series map of the Geological Survey, which was surveyed by Mr. H. H. Howell and Prof. E. Hull, and published in 1855. A memoir descriptive of this ground, prepared by Prof. Hull, was published in 1860 under the title of "The Geology of the Leicestershire Coal-field and of the Country around Ashby-de-la-Zouch." A small portion of the area depicted on the new map (Sheet 155) was comprised in the quarter-sheet 63 S.W. of the Old Series, and was illustrated in the Memoir on "The Geology of the Warwickshire Coal-field" by Mr. Howell, which appeared in 1859. Another smaller Memoir on "The Geology of part of Leicestershire," by Mr. W. T. Aveline and Mr. Howell, which described the quarter-sheet No. 63 S.E., was published in 1860.

The whole region having to be re-examined for the mapping of the superficial deposits, which were not shown upon the old maps, advantage was taken of the opportunity to revise the survey of the underlying formations. A comparison of Sheet 155 of the New Series with the former quarter-sheets of the Old Series which it replaces, will show that considerable changes have been made in the delineation of the geology of this part of the Midlands. The employment of the Ordnance maps on the scale of six inches to a mile has made it possible to introduce more detail and to ensure greater accuracy than was attainable with the smaller scale. For the first time the ancient rocks of Charnwood Forest, so carefully studied by Prof. Bonney and the Rev. E. Hill, have been worked out in such a manner as to allow their various sub-divisions to be represented on a published map. The Cambrian rocks of Nuneaton, formerly supposed to be of Carboniferous age, but proved by Professor Lapworth to be of much older date, were revised by Mr. A. Strahan in 1886. The main sandstones in the Coal-measures near Atherstone have been mapped, while the thin-bedded character of the Keuper Sandstone is now more clearly represented. The Trias is shown to have buried the ancient peaks of Charnwood Forest much more widely than was represented on the older maps.

Some doubt remains regarding the correlation of the deposits coloured on the map as Permian. Some of the sandstones in the extreme south-west corner of the map, hitherto shown as Permian, are for the present bracketed with the Carboniferous formations, but when a larger area of them has been mapped they may possibly require to be relegated to the

3288. Wt. 28344. 500—12/00. Wy. & S.

Trias. In like manner the age of the breccia that surrounds the Leicestershire and South Derbyshire Coal-field has not been determined.

For the first time the superficial deposits in this central part of England have been surveyed in detail and are shown upon a published map. Their plateau-like character forms a striking feature in the region. The alluvia of the various streams are now represented on the map, which thus brings out with great clearness the drainage-lines.

The whole of the map has been surveyed by Mr. C. Fox-Strangways, except the area of Charnwood Forest, which has been mapped by Mr. W. W. Watts. The present Memoir has been prepared by Mr. Fox-Strangways, Mr. Watts supplying the brief account of the pre-Cambrian rocks of Charnwood Forest, which forms the second Chapter.

It is intended that fuller descriptions will afterwards be given of some of the rocks enumerated in the present Sheet-Memoir. Thus, Mr. Fox-Strangways will prepare an account of the Leicestershire Coal-field, and Mr. Watts, who has resigned his position in the Geological Survey to become Assistant Professor of Geology in the Mason University College, Birmingham, has kindly undertaken to supply a full narrative of his researches in Charnwood Forest.

It should be mentioned that manuscript copies of the six-inch field maps are deposited in the Geological Survey Office. For much information with regard to the Coal-fields we are indebted to Mining Engineers, Colliery Managers, and Surveyors, who have freely given access to plans and sections.

ARCH. GEIKIE,
Director-General.

Geological Survey Office,
28, Jermyn Street, London.
9th July, 1900.

CONTENTS.

LIST OF ILLUSTRATIONS.

THE GEOLOGY

OF THE COUNTRY BETWEEN

ATHERSTONE AND CHARNWOOD FOREST.

CHAPTER I.

Introduction.

This sheet comprises an area of 216 square miles, the larger part of which lies in the County of Leicester, but it contains also portions of Derbyshire, Warwickshire, and a small part of Staffordshire. It includes the greater part of the area shown in 63 N.W. of the old survey, but extends somewhat farther to the east, west, and south, although not so far to the north as that map.

Owing to the Drift, which overlies the more solid rocks, being now shown, this sheet has far more detail than the older maps. Some of the other formations are also further sub-divided, particularly the older rocks of Charnwood, showing the structure of this region in a manner that has not previously been attempted.* Six-inch maps being now employed for the fieldwork, it has been possible to trace the boundaries with greater detail. Since the old survey several new collieries have been established, and the workings of the old mines have been considerably extended, so that much additional information has been obtained, that has in all cases been readily put at our disposal. This has thrown much new light on the structure of the rocks, and has enabled many points to be determined with greater accuracy than was possible nearly fifty years ago.

There are no very important towns in this sheet. The principal places are Ashby-de-la-Zouch, Coalville, and Atherstone. It also includes the old town of Market Bosworth, and there are numerous villages, many of which, especially near the mining districts, are of considerable size.

The drainage of the country is entirely within the basin of the Trent, but locally it is separable into two districts drained by the tributaries of that river; the one by the Soar and its branches flowing east; the other by the Mease and the Anker, which flow

* The Charnwood rocks were very fully described by Messrs. Hill and Bonney in the "Quart. Journ. Geol. Soc.," vol. xxxiii., p. 754; vol. xxxiv., p. 199; xxxvi., p. 33; vol. xlvii., p. 78; but no attempt was made to map the structure of the country until the present survey was undertaken. The first results of which were brought before the Brit. Assoc. at Liverpool in 1896 by Mr. W. W. Watts, and published in the "Geol. Mag.," dec. iv., vol. iii., p. 485, 1896.

west. The watershed dividing these two areas passes first in an easterly direction across the map from the high ground east of Ashby by Coalville and Bardon Hill to Copt Oak; and then more southerly by Ellistown, Bagworth, Cadeby, Stapleton, Barwell, and Hinckley.

The highest ground is over the Charnwood Forest district, which at Bardon Hill attains an elevation of 912 feet above the sea. At the foot of these hills, which rise abruptly, there is an extensive plain gradually declining from about 600 to about 400 feet above the sea, which is deeply cut into by the numerous small streams intersecting this plateau. In the western half of the map, between the two Coalfields, where the Drift has been denuded, the plateau-like character has been destroyed, and sharp escarpments are formed by the harder beds of the Permian, Bunter, and Coal-measure sandstones.

The greater part of the surface is covered by the Keuper Marl; which, over the higher ground, is much hidden by Boulder-clay and gravel. The Coal-measures, which cover the next largest area of surface, are separated into two portions forming part of the Warwickshire and Leicestershire Coalfields respectively: the connection between them is hidden beneath a broad belt of Lower Keuper Sandstone. The only other strata, that cover any considerable extent of ground, are the old rocks of the Charnwood Forest district. These, which form some of the most lofty ground in the Midlands, have been denuded into a series of isolated hills; the hollows between which have, in nearly all cases, been filled in with Keuper Marl. The other rocks which crop out, the Permian and Bunter sandstones, and the Cambrian shales of Atherstone with associated igneous rocks, do not occupy any large extent of surface.

The following formations occur in the area:—

Pleistocene and Recent.	Recent and Post-Glacial	Alluvium.
		Loam and Peat.
		Valley Drift.
	Glacial	Newer Boulder-clay, Sand and Gravel.
		Older Boulder-clay, Sand and Gravel.
Trias.	Keuper	Keuper Marl with lenticular sandstone beds.
		Lower Keuper Sandstone with marl bands.
	Bunter	Pebble Beds or Conglomerate, and Sandstones.
Permian		Breccias with Marls.
Carboniferous	Upper Coal Measures	Sandstones and Marls*.
		Shales with *Spirorbis* Limestone.
	Lower Coal Measures	Clay and shales with beds of Sandstone and Ironstone, and numerous coal seams.
Cambrian		Shales with intrusive igneous rocks.
Pre-Cambrian or Archæan		Slates, hornstones, and agglomerates with intrusive igneous rocks.

The soil of the country is mainly dependent upon the underlying formations. Thus the alluvium and some of the Drift beds form the best pastures, while the best corn land is found over the Keuper Marl. Owing to the large proportion of friable soil

* These beds were formerly regarded as of Permian age. See page 28. They are represented on the map by a mixture of the Permian and Coal-measure colours.

especially over the Keuper Sandstone and the Pebble Beds, there is a much larger extent of arable land in this part of the country than in the east, and we do not find the large grazing districts that occur on the Lias. In the Charnwood Forest area, owing to the rocky character of the ground, only the valleys and flanks of the hills can be cultivated, the summits being either woodland or rough moorland.

The principal industry of the district is coal mining, which is now being vigorously carried on in the three separate districts of Baddesley and Polesworth; Moira, Donisthorpe, and Netherseal; and between Whitwick and Bagworth. Other important industries are the quarrying of the igneous rocks for road-stone and pavements, which is carried on at Whitwick, Bardon Hill, Cliffe Hill, Markfield, Groby, Enderby, Narborough, Croft, and south of Atherstone, while flagstones are made of this material at Groby and Croft. The output from these quarries has enormously increased during recent years, very large quantities of broken stone being sent away for macadamising roads, and the manufactured flagstone is rapidly superseding the natural material.

There are important brick and terracotta works in the Lower Keuper beds at Coalville, Ellistown, Ibstock, Heather, and Measham, and in the pot and fireclays of the Coal Measures to the north of Moira. These latter have of late years come into very extensive use, and a large industry in the making of sanitary pipes has arisen throughout the district between Moira and Swadlincote.

A rough slate is obtained from the Charnwood rocks at Swithland and Groby, but it is much inferior to the Welsh slates, and since the introduction of railways these workings have been entirely abandoned except to a very small extent at the latter place.

Manganese was formerly worked in the Stockingford Shales to the south of Atherstone; and limestone in the Coal-measures near Baddesley, but never to any extent. There is no building-stone of any value. The soft sandstones of the Lower Keuper, the Bunter, Permian, and Coal-measures have been used for this purpose; but, except in a few cases, they are far too soft to stand the weather. The slates and igneous rocks of Charnwood are occasionally used for rough or irregular walling. The use of the Drift gravel, which occurs over a large area, is now almost entirely superseded by that of "granite" for road mending; but the Pebble Beds of the Bunter are still worked, to a small extent, at Polesworth for this purpose.

The chief water-bearing stratum of the district is the Lower Keuper Sandstone, the porous divisions of which contain a very large amount of pure water. At Ellistown these rocks yield as much as 390,000 gallons a day. There are also many large springs issuing from the glacial gravels throughout the district. These also yield a very pure water, but in populous districts it is more liable to contamination than that from the deeper-seated sandstone.

CHAPTER II.

PRE-CAMBRIAN.

Pre-Cambrian Rocks of Charnwood Forest.

By Professor W. W. Watts.

On the north-east corner of sheet 155, scattered over an area of about seventeen square miles, there occur a number of rock-masses which are the summits of an old mountain range, whose base is buried deeply under the Trias. These rocks rise to their highest point in Bardon Hill, 912 feet above sea-level, but there are other hills of considerable height, such as Birch Hill and Beacon Hill, both over 800 feet, and Peldar Tor, over 700 feet.

This region is Charnwood Forest and its rocks are the oldest known in the district. They consist of a thick mass of clastic volcanic rocks, with overlying grits and slates; they are intruded upon in places by several types of igneous masses, and the whole of them are of pre-Cambrian age.

SUCCESSION.

The chief local divisions, several of them first indicated by the Rev. Edwin Hill and Prof. T. G. Bonney, and subsequently established and mapped by the Survey, are the following, given in descending order:—

(C) **The Brand Series**
- (c) Swithland and Groby Slates.
- (b) Conglomerate, Grit, and Quartzite.
- (a) Purple and Green Beds.

(B) **The Maplewell Series**
- (e) Olive Hornstones of Bradgate.
- (d) Woodhouse Beds: Hornstones and Volcanic grits.
- (c) Slate-Agglomerate of Roecliffe.
- (b) Hornstones of Beacon Hill.
- (a) Felsitic Agglomerate.

(A) **The Blackbrook Series**: Hornstones and Volcanic grits.

The succession is clearest in the eastern part of the district, but it becomes much confused in the north-west, partly on account of the increased faulting and disturbance, but chiefly on account of the fact that the focus of volcanic activity appears to have been situated in or near this region.

STRUCTURE.

The general structure of the Forest is an elongated semidome with its major axis directed N.W. and S.E.; round this the chief beds can be followed and mapped. This simple structure is, however, much complicated by faulting, which follows on the whole the lines established by mapping and mining in the

Leicester Coalfield. The main set of faults course N.W. and S.E. and the most important of them is the well-known anticlinal fault, extending from near Charley Knoll, through Bawdon Castle, Benscliffe, and near Warren Hill (W.) into Hallgate Hill spinney. East and west of this are other thrust-faults which repeat the beds, showing that the flanks of the arch have been thrust over its keystone. One of the faults following this course from north of Woodhouse Eaves and through the Brand, is a normal fault, concealing some of the higher beds in the Maplewell series. The cross faults run N.E. to S.W., or E.N.E. to W.S.W.; the chief of them skirts the north side of Bardon Hill; a smaller one occurs south of Birch Hill and appears to run out north of Woodhouse Eaves; and a third forms the southern margin of Peldar Tor.

The principal beds, especially Cc, Cb, Bc, and Ba can be traced from their first entry into the area, between Whittle Hill and the Hanging Rocks near Woodhouse Eaves, round the southern side of the anticline to Timberwood Hill and Warren Hill (W.), where their individuality becomes lost. Their outcrop is frequently shifted by faulting, and the beds are often lost sight of altogether on account of faulting or the overspread of Trias, but, where one bed is lost, another one near to it can usually be followed. The structure sketched out in the foregoing paragraph seems to be that which best explains the position, dip, and strike of the exposed rocks, and it is confirmed by an attentive study of the local succession which may here and there be obtained among the crags and scarps.

SUB-DIVISIONS.

The Blackbrook Series.—It has not been found possible to subdivide this series, partly on account of the paucity of exposures, and partly because of the monotony in type of the rocks. Immediately under the Felsitic Agglomerate of Whittle Hill come some exceedingly fine-grained, hard, tuffs, which are quarried as the far-famed Charley Forest "Hone-stones." Under it there is a thick set of fine buff or green ashes, often beautifully banded, fine-grained and flinty, so that they have almost the aspect of felsites, and were considered to be quartzites by Jukes. One coarse band of conglomeratic grit is traceable for some miles in the sheet north of 155, but it is only seen in this sheet near the farm called Rock Villa. The joints in the rocks of this series are generally stained red with oxide of iron, and some bands contain well-developed cubes of hæmatite, pseudomorphous after pyrites.

The Maplewell Series.—These rocks are best seen extending from about Beacon Hill, through the grounds of Maplewell Hall, and thence to Bradgate Park. They admit of the following subdivisions.

The Felsitic Agglomerate.—At Whittle Hill a coarse agglomerate is found below the Beacon Hill Hornstones, which contains fragments of felsite as well as andesite, and but very few or no slate fragments. This we have called the Felsitic Agglomerate. Probably owing to faulting it is soon lost, but fragments of it

are abundant all about Black Hill, and it probably occurs *in situ* in a spinney near the road just a quarter of a mile west of Bawdon Castle. It is caught in the anticlinal fault in Green Hill and Benscliffe Wood, and shattered to pieces in bending round the curve of the dome. It is found also near Chitterman Hills, and probably runs through Irish Farm towards Abbot's Oak. Faulted back from this point, it appears in force on the east margin of Timberwood Hill, and from thence it is traceable through Collier Hill to the margin of the map on Flat Hill. A peculiar character of the rock is that wherever it is exposed it has an exceedingly rough surface, which, however, is not due to the picking out of the fragmental constituents of the rock; indeed, its fragmental nature is best seen on a freshly fractured surface. It is generally jointed at right angles to the bedding and breaks up into pillar-like masses. This rock forms a convenient base to the Maplewell Series.

The Beacon Hill Hornstones are fine green or cream-coloured ashes with occasional grit-bands a few feet thick, generally quartzose and epidotic. They give rise to very characteristic exposures on Beacon Hill and to the northward, and they may be traced round at intervals to Ulverscroft. They are not well exposed on the south-west side of the Forest, and when traced to the north-west and beyond the Bardon Hill fault they appear to pass into a great series of coarse breccias and volcanic agglomerates, in which it is not possible to trace out a sequence in consequence of the absence of all bedding below the higher hornstones and breccias of Warren Hill (W.). These rocks, however, appear to be the equivalent in time of the Beacon Hill Series, but they must have been deposited quite close to the volcanic vent, while only the finer materials drifted on the wind so far away from the vent as the eastern and southern sides of the Forest. If the correlation of the rock on the south of the great quarry on Bardon Hill with the Slate-Agglomerate is correct, the mass of rocks in the Hill, so largely quarried for road-metal, must also be the equivalent of the Beacon Hill Hornstones and of the great agglomerates of Charnwood Lodge and the rest of the district between Timberwood Hill and Warren Hill (W.). The Bardon Hill rocks appear to be in the main of clastic origin as, even in those varieties which are most like lavas or intrusive rocks, bombs or angular fragments can usually be detected: the only exception known to me is the "porphyroid" of the north flank of the Hill and quarries. It is possible that some lavas or intrusive rocks may occur here, but it has not been found possible to separate or recognise them, with the exception of the porphyroid just mentioned.

The Slate-Agglomerate.—Underlying the last division there is a marked band of volcanic agglomerate, named by Messrs. Bonney and Hill the Slate-Agglomerate, because of the abundance of slate fragments which are mixed with lapilli of andesitic rocks, and with broken felspar and quartz crystals. Some of the slate fragments seen in Bradgate Park and Warren Hill (E.) are from four to six feet long, and they are often folded. This band is

traceable at intervals from the foot of the Hanging Rocks through the Brand, Roecliffe, Bradgate Park, the "Altar Stones" at Markfield, the Hollies, probably to Bardon Hill and the western flank of Warren Hill (W.).*

The Woodhouse Beds consist of alternations of coarse and fine volcanic ashes, the former giving rise to grits, highly felspathic and often quartzose, the latter to fine, banded, green, siliceous hornstones generally weathering to a cream colour. They are well exposed in the grounds of the Hanging Rocks north of Woodhouse Eaves,† and after sweeping through Bradgate and the country near Markfield they are well exposed in the crags above Rice Rocks Farm.

The Olive Hornstones of Bradgate.—The highest rocks of the Maplewell series occur in force in Bradgate Park, whence they extend into the area of the adjoining map to the east. They are fine olive-green hornstones devoid of coarser seams, but ashy in composition, and more or less fissile or slaty. They appear to be faulted out of the eastern side of the district from Woodhouse Eaves to Roecliffe and the Brand. It is likely that these rocks are several times seen on the west side of the Forest as in the old quarry below Rice Rocks Farm.

The Brand Series consists largely of rocks deposited under water, the materials being chiefly terrigenous, and derived from the denudation of sedimentary and volcanic rocks, but volcanic intercalations are not at all frequent.

The Purple and Green Striped Slaty Beds are only recognised in a few localities such as Woodhouse Eaves and the Brand, and they are mapped with the Maplewell Series, the conglomerate being used as the most convenient base for mapping the Brand series.

The Conglomerate and Quartzite division is well seen in the Hanging Rocks, the grounds of the Brand, and the N.E. entrance of Bradgate Park. The conglomerate occurs in beds from a few inches to a couple of feet thick; the pebbles may be three or four inches long, but they are usually smaller, and they are made of quartzite, vein-quartz, and slaty rocks; the whole rock is much crushed and cleaved, the long axes of the pebbles being often parallel to the cleavage planes. Above the conglomerate there is usually a thick band of purplish black grit, very rough to the touch and easily recognised. Some bands of this are highly quartzose, and pass into quartzite at Woodhouse Eaves and the Brand. The quartzite gains in strength and importance in Bradgate Park, Lady Hay Wood, and in New Plantation, about a quarter-mile W. of Bradgate House.

The Swithland Slates are purple or green in colour, often satiny and glossy, but the cleavage is somewhat coarse, and the slates, which were at one time much worked for roofing and slabs, are thick and heavy but very durable. The chief quarries were at Woodhouse Eaves, The Brand, Swithland Wood, and the

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* *See* Plate II. † *See* Frontispiece.

country between Groby and Markfield; similar slates were also worked near Bardon Lodge.

FOSSILS.

The only fossils hitherto collected from the area are some worm burrows, the first of which were found by Professor Lapworth in beds on about the horizon of the quartzite or lower slates of the Brand Series in Bradgate Park. Mr. Rhodes has subsequently found other specimens in the same locality.

INTRUSIVE ROCKS.

Three or four types of intrusive rocks are met with in the part of Charnwood Forest included in this sheet.

Porphyroids.—These rocks occur in their most typical aspect at Peldar Tor and Spring Hill, and on the northern flank of Bardon Hill. The dominant type of rock is a porphyritic quartz-andesite or dacite, with large crystals of quartz and plagioclase in a fine-grained matrix. Its relationship to the other rocks in the Peldar area is not clear, but the difficulties which surround its method of occurrence would probably be best explained by supposing it to be intrusive. Messrs. Bonney and Hill regard it as a contemporaneous set of lavas. Whatever may be the relations of the rock of Peldar Tor, the precisely similar rock on Bardon Hill is undoubtedly intrusive, as its junctions with the compact agglomerate of Bardon are exposed along the north side of the great quarries. The junction is irregular, the rock has a chilled margin, it has reddened and altered the Bardon rock in contact with it, and it includes pieces of that rock. A close-grained felsitic rock, much crushed, is found on the Warren Hill Moorland, just south of Charnwood Forest Farm. A porphyroid without quartz, but with porphyritic felspar, occurs at Birch Hill; and another near Alderman's Haw, and at one or two other localities quite near to it on the north flank of Beacon Hill. These rocks appear also to be intrusive, though certain proof of this relationship is wanting. All the porphyroids are crushed and sheared by the main N.W. and S.E. movements, and they were intruded before this movement began. Fragments undistinguishable from some of the varieties of the porphyroids are to be found in many of the agglomerates of the north-west region.

Augite-Syenite.—Another important group of intrusive rocks are augitic granophyres or augite-syenites. They are generally found along the N.W and S.E. fault planes as at Bawdon Castle and Hammercliffe, or else swelling out into large kernel-like masses such as those of Newtown Linford and Bradgate Park, Groby, Bradgate Woods, Markfield, Cliffe Hill, and Stanton-under-Bardon. The rocks are much altered and full of epidote, but they appear to have originally contained hornblende, augite, orthoclase, and plagioclase, embedded in a granophyric groundmass. They consolidated under plutonic conditions and appear to bear no direct relationship to the porphyroids or the con-

Volcanic agglomerate in Charnwood Forest. The large bombs have been turned on end or squeezed flat by the pressure which has cleaved the rock.

From "Geology for Beginners," by W. W. Watts (Macmillan & Co.), 1898, Fig. 104, p. 153.

Section in Charnwood Forest; showing unconformable junction of Triassic marl (*f*), resting in an old valley excavated through the ancient (pre-Cambrian) slates (*r*).

From "Geology for Beginners," Fig. 155, p. 222.

stituents of the agglomerates. The southern group of syenites is somewhat more acid than the northern, and the rocks bear evidence of having suffered from earth-movement, so that the thinner masses are much crushed. The northern group is more basic, darker, denser, and harder, and as it came up along the fault-planes it is later in date and is not affected by the movement; indeed it has come up along the fault-planes developed in the later stages of the movement. Similar syenites emerge from beneath the Trias at Enderby, Croft, and elsewhere to the south, and near the former place they are in contact with slates of Charnwood type. These rocks are much quarried everywhere for paving setts and road metal. They must be distinguished from the diorites or camptonites of the Warwickshire district, with which they have little or nothing in common.

AGE AND CORRELATION.

The Charnwood rocks are not at all like the Cambrian rocks of the Nuneaton district, nor are they like the felspathic tuffs and breccias which underly them. It is useless to parallel them with anything more recent than the Cambrian System and they are not like the Uriconian or Torridonian rocks, unless we except the grits and conglomerate of the Brand series, which have some resemblance to the Torridonian rocks. On the other hand, they have nothing in common with the gneisses and schists of the North-west or Central Highlands of Scotland. Many of the individual bands are like those of the Longmynd, in Shropshire, and, indeed, if we could imagine the pyroclastic materials from the Charnwood volcano dropped far from the vent and sorted and stratified in water, they would be likely to produce a group of rocks much like those of the Longmynd. It is impossible at present to push the comparison further, and meanwhile it may be better to be content with naming the whole group the *Charnian System*, and to refer it to some unascertained position in the great pre-Cambrian sequence.

RELATIONSHIP TO THE TRIAS.

In the sheet under consideration the Keuper Marl is the only newer rock found in contact with the ancient rocks of the forest. The unconformable junction is seen at several places. At Bardon Hill and elsewhere, the ancient rocks plunge down with a steep slope under the marl. A small breccia fringe is sometimes seen at the junction, but it never extends far from the old rock; some of the bands of skerry are made up of Charnian débris. At Bardon Hill, in the slate quarry at the south end of the Hanging Rocks, and in the slate quarry in Swithland Wood, near the Brand, the marl is found filling up old valleys in the slates or agglomerates. One of the junctions is shown in the annexed figure.*

* *See* Plate II.

LANDSCAPE.

The earth-movement which folded, faulted, and cleaved the rocks of Charnwood Forest, and guided the intrusion of igneous rocks into them, appears to have been of pre-Cambrian date, as no such effects are produced in the neighbouring Cambrian rocks of Nuneaton. After this mountain-making movement, which in places has converted the porphyroids into augen-chlorite-schists, the region was subjected to marine and sub-aerial denudation, possibly several times before the Carboniferous Period. During Carboniferous Limestone times some submergence and deposition took place on the northern skirts of the Forest, but it was not until Triassic times that the whole of the old mountain chain was completely enveloped in sediment. It is quite possible that the very highest summits were not even then covered. But the finishing touches to the landscape forms of the rocks were executed in Triassic times, and as the majority of the rocks are only just now being uncovered they still present a scarcely altered Triassic landscape. To this day many of the summits are as rugged and precipitous as when they were mountain-tops overlooking a Triassic desert or just submerged beneath the waters of a Triassic lake.

W. W. W.

CHAPTER III.

CAMBRIAN.

Besides the great mass of strata which form the Charnwood Hills, there is another small area of old rocks, which just comes into the map to the south of Atherstone. This is the northern extremity of the outcrop that extends along the hill from Bedworth, south of Nuneaton, to Waste Hill, beyond Atherstone, a distance of nine or ten miles.

These beds, known as the Stockingford Shales*, were originally mapped as Carboniferous, having been supposed to represent the lower or unproductive part of the Coal-measures; but in 1882 Prof. Lapworth brought forward convincing proof that they must be of Cambrian age.† The history of this error, how it arose, and the views entertained by authors at different times, has been clearly given by Mr. Strahan in his account of these rocks,‡ so that we need not pursue the subject further here.

The Cambrian rocks of this district consist of red, purple, olive-green, and grey shales, with a few dark carbonaceous bands; and, allowing an average dip of a little over 20°, have a thickness of about 2,000 feet. They are separable into two main subdivisions: a lower series of purple, green, and grey shales, with many small Brachiopoda of the genera *Lingulella* and *Obolella*, and an upper series of grey shales, with black bands, containing *Agnostus* and *Olenus*. These shales are well laminated, but not in the least cleaved, and dip to the south-west at angles varying from 15° to 35°. They are traversed by numerous parallel dykes of diorite,§ which give rise to the broken, undulating ground south of Atherstone, forming some of the prettiest scenery in the map.

These sheets of igneous rock, although they are really intrusive, follow the line of strike so closely that at first sight they appear to be interbedded with the shales. That they are intrusive, however, may be seen by the baked nature of the shales near the line of contact, and more clearly in the quarry south of Merevale Church, where the shales are dipping 15° to the south-west, while the igneous rock inclines at an angle of 35° in the same direction.

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* This name was first suggested by Mr. W. Jerome Harrison, from the locality where these beds are best shown.

† Geol. Mag. dec. ii., vol. ix., p. 563, 1882; and dec. iii., vol. iii., p. 319, 1886. There is also a full account of these rocks by Prof. Lapworth, with an appendix by W. W. Watts in Proc. Geol. Assoc. for August, 1898, vol. xv., part ix.

‡ Brit. Assoc. Rep. for 1886, Trans. of sections, p. 624; and Geol. Mag. dec. iii., vol. iii., p. 540, 1886.

§ For description of this rock see Allport, Quart. Journ. Geol. Soc., vol. xxxv., p. 637, 1879.

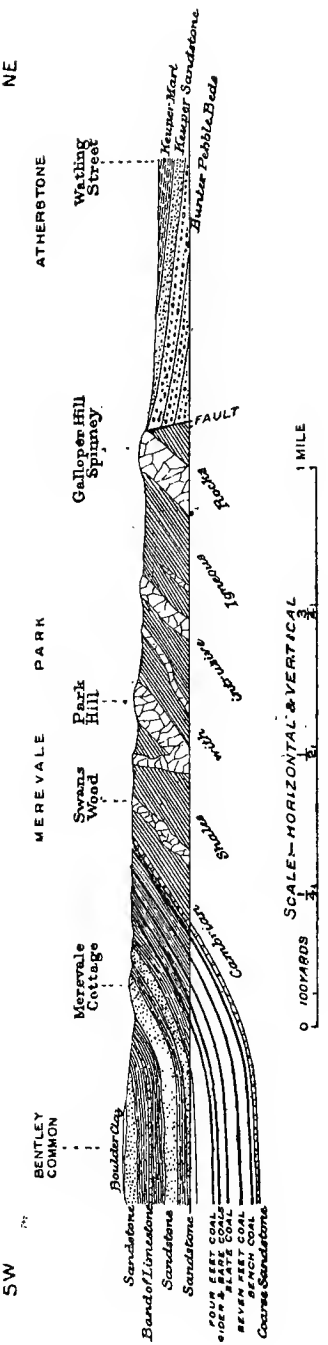

FIG. 1. Section across the northern edge of the Warwickshire Coalfield.

The outcrop of the Stockingford shales is, from the absence of Drift, generally very clear, and may be followed without much difficulty. The best sections, are, however, just beyond the edge of the map at the quarry below Oldbury Reservoir, and in the lane and new drive at Purley Park.

Professor Lapworth has separated these shales into three series. The Lower, or Purley Shales, formed of brightly coloured *purple* mudstones and shales, occur along the lower part of the Outwoods; the Middle or Oldbury Shales, formed essentially of *black* shales, enter the map in Merevale Park; and the Upper or Merevale Shales, formed of *grey* shales, are found near the road south of Merevale Abbey.*

The sheets of igneous rock vary from dykes, having a thickness of 200 yards or so, to mere strings of rock which cannot be traced. They obtain their greatest development in Merevale Park, in the thick mass immediately south of the hall; but the outcrop is not so extensive, and is more split up into thin sheets and strings, than shown in the old map. It is not, however, easy to follow the outcrop of these thin beds in the woods south of the park.

The composition of the diorite (camptonite) has been so ably described by Allport,† Teall,‡ and Watts,§ that it is needless to give a detailed description of it here. The predominant and characteristic constituents are a triclinic felspar and hornblende, together with a little magnetite and apatite; a glassy or felspathic matrix is also nearly always present.

The following fossils have been obtained from the shales:—

LIST OF FOSSILS FROM THE STOCKINGFORD SHALES. ‖

Sponges.

Hyalostelia [=Pyritonema].
Protospongia fenestrata, *Salt.*

Crustacea.

Agnostus cf. cyclopyge, *Tullberg*
„ pisiformis, var. socialis, *Linrs.*
Beyrichia Angelini, *Barr.*
„ cf. nana, *Brög.*
Conocoryphe ? coronata, *Barr.*
Ctenopyge pecten, *Salt.*
Leperditia cf. primordialis, *Linrs.*
Olenus nuneatonensis, *Sharman*
„ cf. Salteri, *Call.*
Sphærophthalmus alatus, *Boeck.*

* Proc. Geol. Assoc., vol. xv., p. 345.

† Quart. Journ. Geol. Soc., vol. xxxv., p. 637.

‡ British Petrography, pp. 133, 251, and Plate xxix.

§ Proc. Geol. Assoc., vol. xv., p. 394.

‖ This includes all the species given by Prof. Lapworth in his amended List (Proc. Geol. Assoc., vol. xv., p. 348, 1897), where details of the localities will be found.

Bryozoa.

Dictyonema sociale, *Salt.*

Brachiopoda.

Acrothele granulata, *Linrs.* [=Obolella granulata, *Sharman*]
Acrothele cf. A. intermedia, *Linrs.*
„ sp. cf. Kutorgina ? pusilla, *Linrs.*
Acrotreta sp. [=Obolella Sabrinæ ? *Sharman*]
Kutorgina cingulata, *Billings*
„ labradorica, *Billings*
Lingula sp. [=L. lepis ? Lingulella Nicholsoni, and L. pygmæa of earlier lists].
Obolella cf. sagittalis, *Salt.*
„ Salteri, *Holl.*
Orthisina cf. transversa, *Wahl.*

Mollusca.

Coleoloides typicalis, *Walcott*
Hyolithus cf. lenticularis, *Holm*
„ „ obscurus, *Holm*
„ „ princeps, *Billings*
„ „ tenuistriata, *Linrs.*
Orthotheca communis, *Billings*
„ corneola ? *Holm*
„ de Geeri, *Holm*
„ Johnstrupi, *Holm*
„ cf. teretiuscula, *Linrs.*
Stenotheca rugosa, *Walcott*
„ var. abrupta, *Walcott*
Scenella sp.

CHAPTER IV.

CARBONIFEROUS.

Coal Measures.

THE NORTHERN OUTCROP OF THE WARWICKSHIRE COALFIELD.

The Coal-measures which outcrop in this map form two separate districts, one comprising a portion of the northern part of the Warwickshire coalfield, the other the southern part of the Leicestershire and South Derbyshire coalfield. These will be described at greater length, when the whole ground has been surveyed, in special memoirs treating of these two coalfields respectively, so that in the present case we propose merely to give an outline of the structure of as much of the ground as falls within the limits of this map.

Whether these two coalfields are connected beneath the overlying Trias is at present scarcely decided, but the evidence, as far as it goes, is against the supposition that such is the case, or that coal will be found over much of the intervening ground.

That portion of the Warwickshire Coal-measures with which we have to deal is the eastern side of the northern half of the coalfield, and includes an area of about seven square miles in the south-west corner of the map. It contains at the present time four working collieries, which have afforded six or seven sections of strata and other information, that has enabled the general structure of the ground to be made out with greater accuracy than was possible when the old survey was undertaken.

These measures, which have a thickness of about 1,000 feet, consist of an alternating series of sandstones and shales, with several beds of ironstone and seams of coal and fireclay, and near the top one or two beds of limestone. At the base there is a bed of coarse false-bedded ferruginous sandstone, with quartz pebbles, which rests unconformably on the Stockingford shales.

This sandstone, which was first pointed out by Mr. Strahan, is of a buff or yellow colour, and so soft as to be readily used as a building sand. It is of great assistance in tracing the junction between the Cambrian and Carboniferous formations across the country, the white quartz pebbles being very conspicuous, and at once arresting the attention where this junction might be overlooked. This rock is best seen along the lane and in some old quarries on the east side of the Monk's Park Wood, where the unconformity is very marked, the sandstone, which is nearly flat resting on the Cambrian shales, dipping at an angle of 38°. It

may be followed across the wood to the north side, where there is a small quarry in it. After crossing Mercvale Park it makes a good feature as far as Waste Hill, where it comes against the boundary fault, but appears to be continued as a less coarse, but thicker, sandstone nearly as far as Suckle Green.

The Coal-measures lie in a flattish synclinal trough or basin, having its longer axis in a north and south direction, which turns up rather rapidly as it approaches the western, northern, and eastern margins. It was formerly supposed that, in the extreme northern part of the coalfield, about Shuttington, the workable seams of coal would be found at some considerable depth; recent workings, however, at Tamworth Colliery have shown that this is not the case, but that the beds turn up somewhat rapidly as they approach the large boundary fault, the Seven-feet coal not being more than 70 yards deep on the north side of the road to Polesworth, while it is 170 yards deep at the Colliery. The southerly dip seen in the lane to Shuttington also shows that the beds are rising towards the village.

The thicker seams of coal are all in the lower part of the series, and comprise about a dozen seams that have received names, besides several thinner beds of coal. Since the number of pit sections has been increased it has become easier to correlate the various seams than was formerly the case; but it is still probable that some of them which have received distinct names at different collieries are really the same beds.

Mr. Howell, in his description of this coalfield, gives a comparative section showing the splitting up of the coalseams and the increase in the thickness of the measures between Hawkesbury Colliery in the extreme south of the coalfield and Stratford Pit on Baxterley Common in this map.* The same thickening of the measures takes place, although in a less degree, further to the north-west, as is shown by the accompanying section.

The principal seams in this part of the coalfield are the Four-feet, Rider, Barc, Slate, Seven-feet, and Bench, all of which have in old times been worked either in shallow pits or at the outcrop; but at the present time the Seven-feet coal is the seam principally worked at the collieries. The Bench coal is said to be inferior throughout the greater part of the district. The fireclays associated with these coals are not used at any of the pits in the map, but further west at Amington and Glascote the clay under the Seven-feet coal is mixed with another clay, and used for firebricks. At Dordon clays higher in the series are used.

It is in the measures immediately above the Four-feet coal that the principal beds of sandstone are met with. They consist of irregular masses which as a whole can be readily traced across the country, although the separate beds frequently thin out in short distances. They form the abrupt edge that runs from Mercvale to Polesworth, and along which they have been quarried at a few places.

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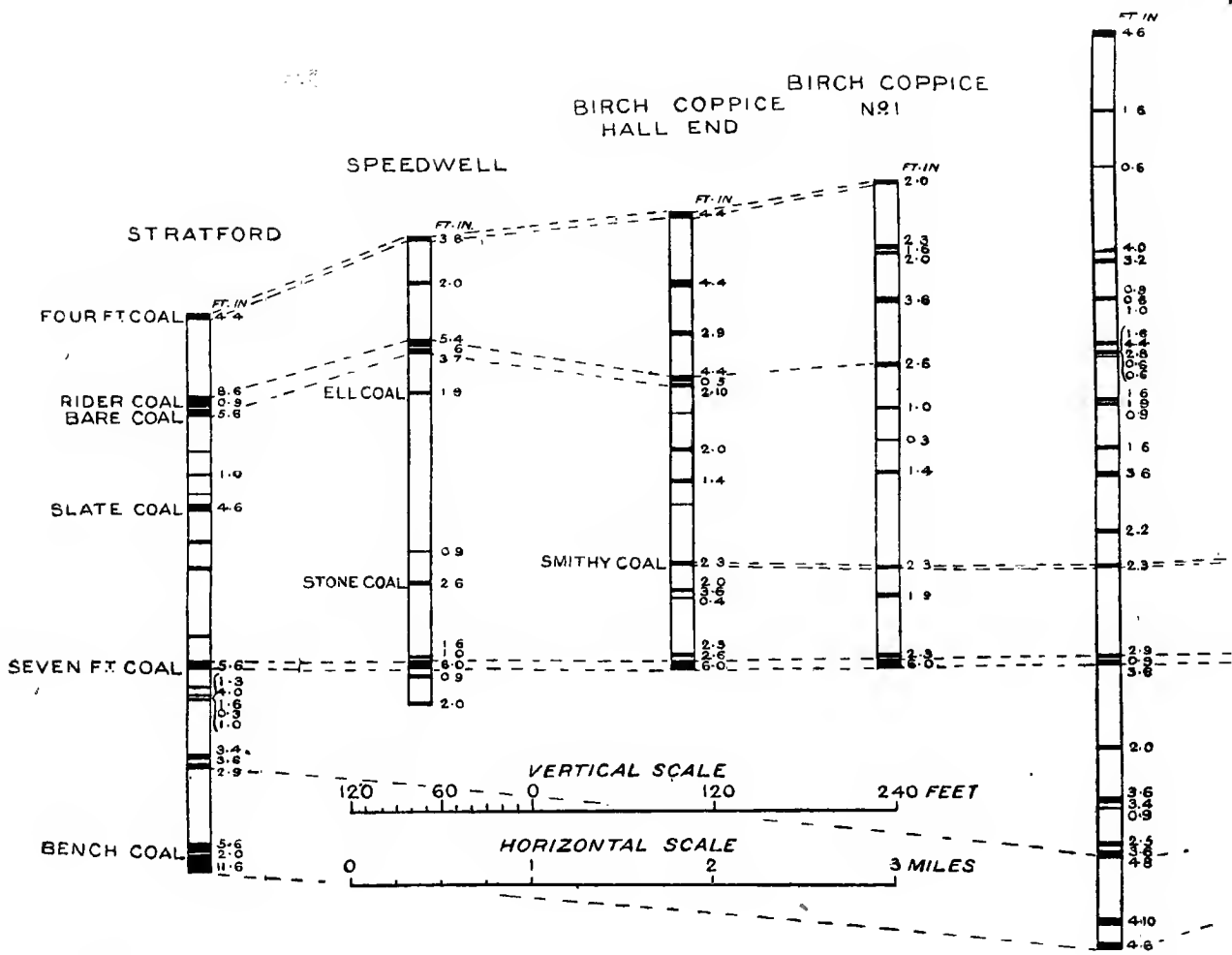
* Memoirs of the Geological Survey. The Warwickshire Coalfield, p. 10.

FIG. 2. Comparative Section of Coal Seams in the extreme north of the Warwickshire



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The following depths of the Coal at the different pits throughout the district will help to show the general position of the seams :—

	Four-feet Coal.	Rider Coal.	Seven-feet Coal.	Bench Coal.
	Yards.	Yards.	Yards.	Yards.
Stratford Pit	231	250	308	
Waste Lane, 200 yds. from south corner of Grendon Wood	—	90 (?)		
Baddesley Common, 150 yds. south-east of the Red Lion Inn	50			
Baddesley Church	60 (?)			
Well just outside north end of Grendon Wood	—	—	40	
Old shaft, 400 yds. west of Church	—	—	200	
Speedwell Pit	140	163	234	
Old Grave Yard Pit	—	110		
Snibson's Wood	—	30		
White House	60	—	170	
Bassett's Bridge, Polesworth	—	—	110	170
Butt Lane, 450 yds. south of Polesworth Station	—	—	100	
Pit at side of railway south-east of Polesworth Station	—	—	60	
Birch Coppice Colliery (shaft at Hall End)	173	209	270	
Birch Coppice Colliery (shaft at Birch Moor)	159	200	265	
Pooley Hall Colliery	—	—	155	185
Tamworth Colliery	71		170	218
1,000 yds. north-east of Tamworth Colliery	—	—	65–80	

The outcrop of these seams can be readily followed by the lines of old workings along the slope of the hill from Merevale to Polesworth, although in some cases it is rather doubtful what seams were worked in certain pits.

In Monk's Park Wood indications of two coal seams are seen in the stream at the old ponds, and the outcrop may be traced by the lines of old pits to the northern corner, where one of the upper beds is seen in the ditch by the side of the wood. Mr. Howell states that "At Monk's Park the Seven-feet, the Slate, and Rider coals were wrought formerly to a depth of nine yards, and another coal called the 'Smithy' was also wrought to the same depth. Ironstone was also raised at the same place, and smelted by charcoal; but what particular bands were used is not stated, though they were probably from under the Seven-feet coal, where they occur in large balls, as shown in Vertical Section No. 6, Sheet 21."* The slag heaps from these old furnaces may be seen near where the old ponds were in the lower part of the wood.

In the road on the north side of the wood there are several indications of coal, and also across Merevale, one or other of the seams being seen in several places. At Colliery Farm the workings

* *Loc. cit.* p. 17.

to the Seven-feet coal are very apparent, as well as those to some of the higher beds. In Grendon Wood there are a large number of old pits, especially to the Seven-feet coal; but the outcrop of the higher beds, which leaves the wood and crosses the northern side of the village of Baddesley Ensor, is not quite so clear. North of this the Seven-feet and Bench coals outcrop in Baddesley Wood; and there are indications of the higher beds in the fields above and about Snibson's Cottage. In the valley of the Penmire Brook there is an east and west fault running nearly along the line of the Watling Street, which has been proved in the Birch Coppice Colliery to have a downthrow to the north of twenty-five yards. This fault must shift the outcrop of the coal seams somewhat to the east, but on account of the high westerly dip its effect is not very marked. In Birch Coppice old coal pits are again very frequent, but to which seams some of them were sunk is not very clear. North of this wood the double seam, known as the Rider and Bare coal, is stated by Mr. Howell to die out. He says, "As the workings here have been some time abandoned I could not obtain any very accurate information as to the exact point where the Rider and Bare coal disappeared, or the way in which this 'double coal' terminated; but as far as I could make out from the description given me of the last workings by Mr. Scarrot, of Polesworth, there was no large fault, using that term in its correct sense, but the place of the coal seems to have been taken by a bed of fireclay; and according to the accounts I obtained from the old miners, the coal terminates quite abruptly, the strata, however, not being shifted up or down. That it was not a *slip* fault was proved by the other coals, both above and below, being found to continue further north without any interruption."*

At Dordon Brickyard the following thin coals are seen:—

	ft.	in.
Sandstone	several feet.	
Dicey coal	1	4
Measures	20	0
Coal		10
Measures	4	0
Coal	4	0
Measures	2	0
Smut		
Measnres	1	0

The beds dip at an angle of 15° to the west, but they are said to turn over and to be found again on the east side; so that it is probable that the thicker seam is the Four-feet coal, which outcrops a little lower down.

Between here and Polesworth nearly all the seams appear to have been worked at the outcrop, but there is not much evidence for identifying the different beds. In the railway cutting south of Polesworth Station two seams of coal 4ft. or more in thickness are to be seen. The identity of these coals is now much obscured, but probably was much clearer at the time the following statement was written:—"The Four-feet, Slate

* *Loc. cit.* p. 15.

and Seven-feet coals crop out in the railway cutting between Polesworth Station and the bridge, and the Bench coal on the south-east side of the bridge. The measures are much broken and disturbed where exposed in this cutting, and have a general dip to the west at an angle of 45° to 50°, and the unusually high angle at which the strata are inclined is accounted for by the close proximity of the boundary fault, which here runs along the east side of the railway." *

We feel rather sceptical as to the absence of the Rider coal and the great thickness (7ft. 3in.) given for the Slate coal about Polesworth. At Pooley Hall Colliery, which is only just on the other side of the river, the section of the different coal seams does not at all correspond with that of the old Polesworth Colliery.† We, therefore, cannot help thinking that in this latter pit the seams were wrongly identified. It is difficult to correlate the several seams in these two sections; but if the seam at the bottom of the old Polesworth shaft is taken as the Double Coal, the Slate Coal (7ft. 3in.) would be the Seven-feet Coal of other collieries; and the character of the intervening measures seems to correspond better on this hypothesis.

Again, it is very doubtful if the Rider Coal really dies out altogether, as stated by Mr. Howell. This coal is worked at Birch Coppice, and is 2ft. 6in. thick in the old shaft on Birch Moor, which is a good deal north of where it is said to die out. The measures in the colliery sections north of this have altered so much that at present it is impossible to correlate these thin seams; but probably there will be further evidence on this point when the rest of the coalfield is surveyed.

To the east of Polesworth and Dordon the Coal-measures roll over and dip to the east into the great boundary fault, so that the outcrop of the different seams is repeated along a strip of ground parallel with the fault between the Anker and the Penmire Brook. There are indications of the lowest of these seams in the lane 170 yards west of St. Helena, and in the ditch 250 yards south of that farm. Other seams are to be seen near St. Helena, in the lane 400 yards west of Dordon Hall, and in the fields near Hare Parlour. A five-feet seam of coal was met with in the well at St. Helena; and in the California Pit, which was about 200 yards to the north-east, a coal was reached at fifteen yards. There are also the remains of old coal workings at two or three different horizons in the eastern part of the Hollies. Mr. Howell, in writing of this part of the coalfield, says: "The coal has never been worked to any extent on this easterly dip, being much broken and faulted. Attempts were, however, made to work the Seven-feet coal by the side of the lane between Polesworth and Dordon, and the bed was followed in from the crop for a considerable distance, but was found to be so much

* *Loc. cit.* p. 13. The recent widening of the railway shows that the beds are very much disturbed here. Three coal seams crop out between the two bridges, and there are three thin coals a little east of this which may represent the Bench Coal.

† Hor. Sections, Sheet 21, No. 4.

shattered by small faults as to be altogether unprofitable. These faults were described to me by Mr. Scarrot, the manager of the colliery at Polesworth, as continually throwing down the coal to the east, sometimes many yards, and all running parallel with the boundary fault of the coalfield. It was in consequence of these numerous dislocations that the working of the coal was abandoned, as it was considered that they would most probably continue till the great boundary fault was reached, which would throw the coal down on the east to an unknown depth beneath the New Red Sandstone."*

In the upper part of the Coal-measures there are apparently two beds of limestone; we say apparently two beds, because from the outcrop it is not very clear whether this is the same bed repeated by a fault or roll of the strata, or whether there are really two distinct bands. At present no sinking has been made above the higher bed which would at once prove the case.† This limestone has a thickness of about three feet, and contains the small serpula *Spirorbis pusillus*, Mart. (*Sp. carbonarius*, Murch.); it varies in colour from buff or light grey to a dark slaty blue. It has only been seen *in situ* in the stream in Monks Park Wood; but it was met with in a well on Bentley Common, and in the Stratford Pit on Baxterley Common, at both of which places it was about a yard thick. Although it is not seen to the north of this its outcrop may be traced by the old workings to it north of Long Wood and Cowper's Grove. At the latter place the feature formed by the outcrop terminates abruptly, and there is not much evidence for it further in the same line of strike. Further south, however, at the base of the sandstone escarpment, the limestone appears to be again in force, having been worked in a line of pits between Ash Spinney and Lower Ridding. Fragments of the rock are again seen around the promontory at Baddesley as far as the plantation at the edge of the map, called the Dumbles, where there are old workings. At first we were inclined to think that the outcrop of limestone at Cowper's Grove was broken by a fault; but on further consideration it seems more probable that there are two bands of limestone along the foot of the escarpment between Baddesley and Baxterley.

* *Loc. cit.* p. 14.

† A pit has lately been sunk near Kingsbury Wood, on the other side of the Baddesley promontory, which reached a limestone conglomerate nine feet thick at about fifty yards below the outcrop of the limestone that has been mapped, but the Survey has not been carried far enough yet to show the connection between the two.

CHAPTER V.

CARBONIFEROUS—(*Continued*).

Coal Measures—(*Continued*).

THE SOUTHERN PART OF LEICESTERSHIRE COALFIELD.

The Leicestershire and South Derbyshire coalfield comprises an area of between seventy and eighty square miles, of which only the southern portion comes within the limits of this map.

This part of the coalfield is divisible into two areas; the Eastern or Coleorton coalfield, and the Western or Moira coalfield. These are separated from each other by an anticlinal arch of lower unproductive measures, containing only a few thin seams of coal, which rise up from below, and come to the surface near Normanton, Packington, and Ashby. One of these coal seams is seen in the railway cutting at Breach Hill: and there are indications of two or three other seams to the north of Normanton.

On the west side, close to the Boothorpe Fault, there are two or three seams seen in the railway cutting north of Willesley Wood, one of which is probably the representative of the Rafferee coal that crops out at Woodville, and will be further referred to in the description of that country.

These measures dip to the east on the east side of Ashby and Packington, and to the west on the west side of these places, which are nearly on the line of axis. Mr. Coleman states that their thickness is at least 1,000 feet, but what was the evidence upon which this statement was based we do not know.*

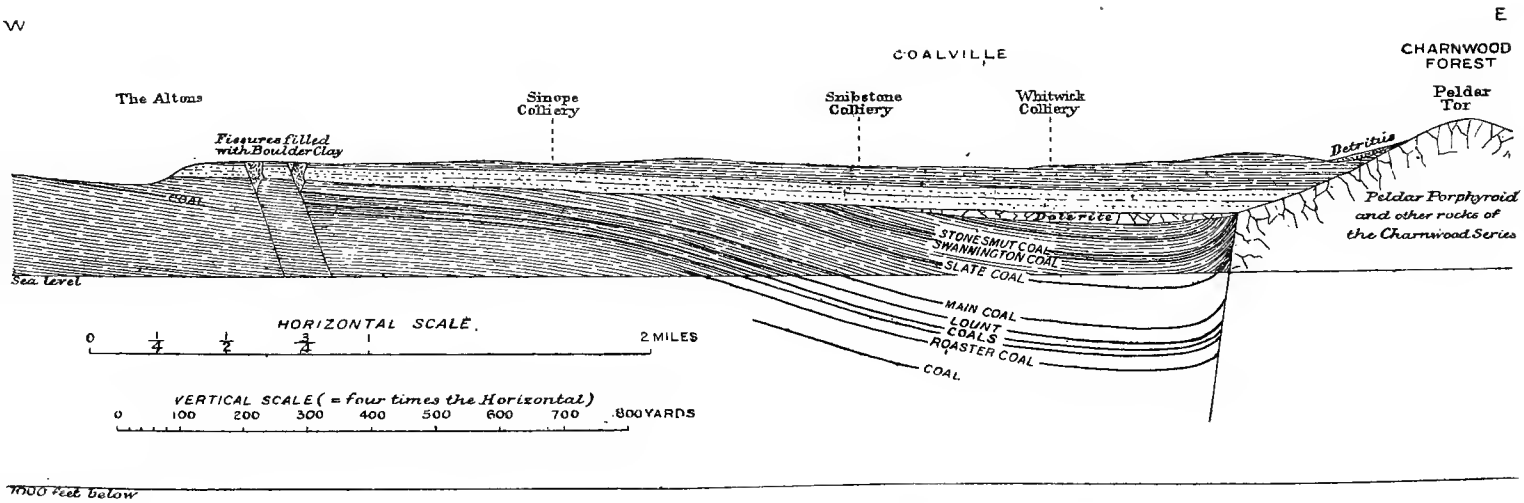
Coalville District.

The eastern or Coalville portion of the coalfield is almost entirely concealed by the overlying Triassic rocks, so that it is only over a small area at Heather and along the bank below Alton Grange that the Coal-measures come to the surface, and are shown by colour on the map. They have, however, been proved by collieries and borings to extend as far south as a line drawn from Heather to Desford, and may be found a little beyond this, but it is not likely that they extend very much further, as borings in the neighbourhood of Market Bosworth have proved the absence of Coal-measures: neither do they extend east of a line drawn from Whitwick through Thornton to near Desford.

This area is bounded on the west by the outcrop along the bank running from Alton Grange southwards, although beyond Normanton it is completely masked by the overlying Trias. On

* Rev. W. H. Coleman in White's History of Leicestershire. Ed. 2, p. 92, 1863.

FIG. 3. Diagram showing position of strata on the east side of the Ashby anticline.



the east the boundary is formed by the large fault which brings up the Charnwood rocks, and against which the Coal-measures turn up at a sharp angle. This fault has been proved in the Whitwick Colliery to run from the western side of the village of Whitwick to Broom Leys, and it is probably continued by Bardon Hill Station to Thornton and the eastern side of Desford.

This portion of the coalfield contains about eight workable seams of coal, varying in thickness from three to nine feet. Some of the higher seams have been worked at Bagworth, Ibstock, and elsewhere in old times; but the principal seams now used are the Upper Main or Coleorton Coal and the Lower Main or Roaster Coal.

The general dip of the beds is to the east at about 4°, they are therefore deepest about Ellistown and Bagworth, and crop out to the west beneath the New Red Sandstone; so that the higher seams, which occur in these shafts, are absent in those of Nailstone and Ibstock, while at Heather only the lowest seams are present.

Over the Coal-measures to the south of Whitwick there is a sheet of dolerite*, which has been ejected in a molten state from the line of the boundary fault, and run over them probably before the Triassic rocks were deposited, as where the rock is found in contact with the coal seams the latter are burnt to cinders, while the sandstone above does not appear to have been subjected to heat.

This rock is 81 feet thick in the eastern shaft (No. 6) of Whitwick Colliery, but thins out towards the north-west and south, being absent in the Snibston Pits (Nos. 2 and 3), as well as those at Ibstock, Nailstone, and Bagworth, but occurs at South Leicestershire and Ellistown. Its general extent and thickness may be gathered from the diagram given on the following page.

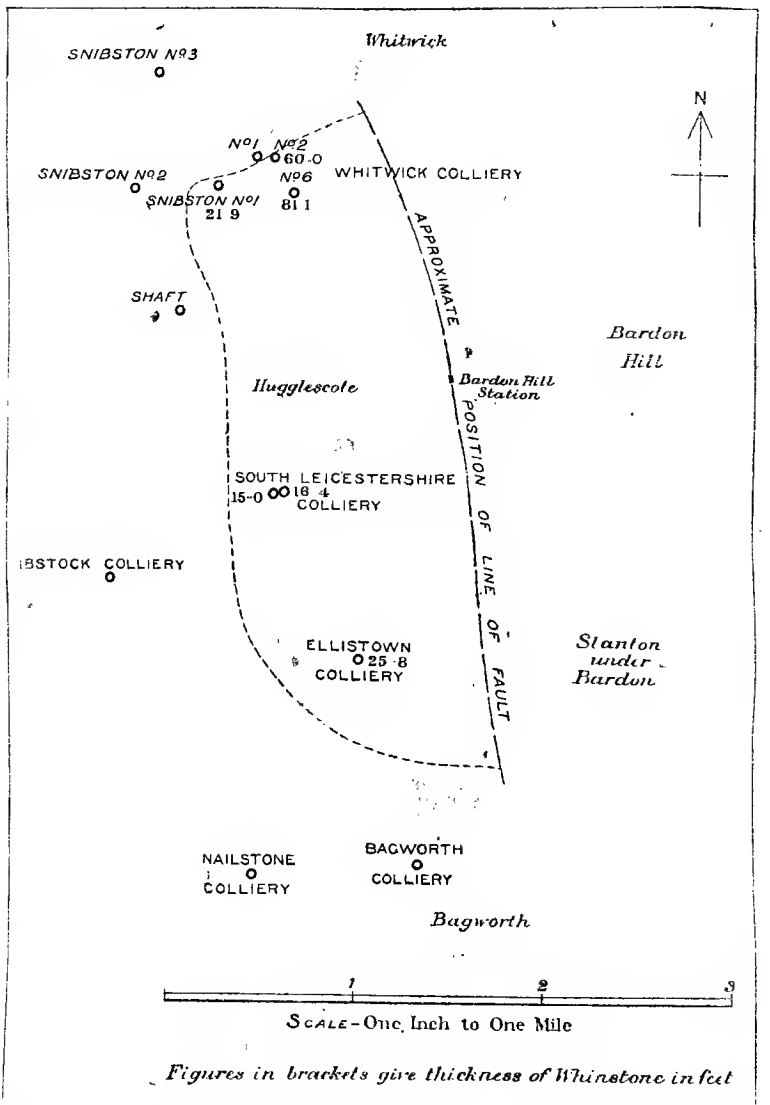
Moira District.

The western or Moira portion of the coalfield occupies a large part of the north-west quarter of the map. The Coal-measures over this area are much more exposed than in the Coalville district; and it is only along the western and southern portions that they are covered by Trias. The strata in general dip to the west, but along the western and southern margins they turn up, as well as to the north beyond the limits of the map; they therefore form an irregular basin, of which the deepest part is about Moira. On the east they are cut off by the great Boothorpe Fault, which brings up the unproductive measures of the Ashby district.

These Coal-measures have been proved to a depth of over 1,600 feet; they contain many valuable seams of coal, the details of which will be given in the special memoir on the coalfield. A general idea, however, of the seams and the thicknesses of the intervening measures may be gathered from the following table:—

* See S. Allport, Geol. Mag., vol. vii., pp. 159 and 435, 1870, and Quart. Journ. Geol. Soc., vol. xxx., p. 540, 1874; also J. J. H. Teall, British Petrography, p. 211, 1888.

FIG. 4. Plan of the East Leicestershire Coalfield, showing supposed extent of the Whinstone



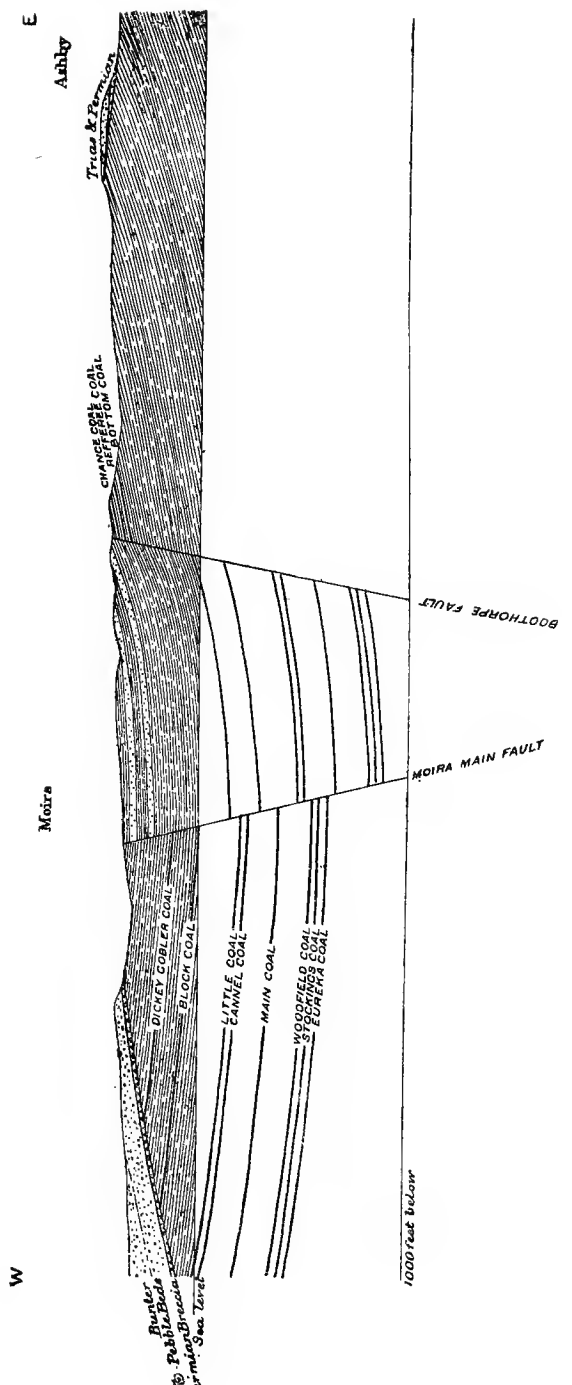


FIG. 5. Diagram showing position of strata on the west side of the Ashby anticline

Thickness of the Coal seams and intervening measures in the Moira District.

	Average thickness of Coal seams.	Thickness of intermediate measures.
	ft. in. ft. in.	Yards.
Ell Coal	3 11	
Measures - -		70 0 to 75 0
Dickey Gobbler Coal -	3 0	
Measures - -		40 0 to 44 0
Jack Dennis Coal	3 8	
Measures -		70 0 to 80 0
Little or Five-feet Coal	*4 6	
Measures		50 0 to 60 0
Main Coal average	15 0	
Measures		10 0
Toad Coal	3 6 to 4 0	
Measures		20 0 to 23 0
Slate Coal	3 8 to 4 0	
Measures -		18 0 to 20 0
Woodfield Coal	6 4	
Measures -		15 0 to 21 0
Stockings Coal	8 4	
Measures -		12 0 to 15 0
Eureka Coal	4 0 to 5 0	
Measures		30 ?
Stanhope Coal ? -	4 7	
Measures -		95 ?
Kilburn Coal ? - -	4 6	

* Four-feet Coal of Prof. Hull and his maps and sections.

The principal of these seams, and the one most generally worked is that known as the Moira Main Coal, which is wrought at every colliery in the district, and is now exhausted over a large area. Besides this seam the Five-feet or Little Coal, the Stockings and the Eureka are worked at some of the pits.

In the upper part of the measures are a series of valuable pot-clays, and one or more beds of fireclay, which have been worked in the neighbourhood of Woodville for a number of years for making sanitary pipes and other purposes. These are now being utilised in the Moira district, and the expansion in this trade has been so great that several new works have been established here during the last few years.

The Main Coal and some of the neighbouring seams outcrop to the north of Measham, but are thrown in again by a north-east and south-west fault, so that the Main seam is at a depth of 42 yards below the village. It will be noticed that the position of this fault is somewhat different from that shown on the old map. The reason for this alteration is that additional evidence has been obtained as to the position of the coal seams on the west side of the village, which shows that the run of this fault is rather different than formerly supposed. The evidence for the somewhat obscure mapping about here will be given in the general memoir on the coalfield.

South-east of Measham the measures gradually rise again, the Main coal being only about nineteen yards deep under Measham

Field, south of which it appears to be thrown out entirely. Higher seams of coal crop out in other parts of the district, but as they have not been considered worth working they are seldom exposed to view, and it is not possible to map them with any certainty. A coal about three feet thick, said to be the Dickey Gobbler, is seen in the railway cutting at Donisthorpe, and other seams are seen in the clay works about Moira, but they cannot be traced across country. In fact, it is so long ago that any coals have been worked near the surface, and all the men that worked at them being long since dead, that it is very difficult now to trace their outcrop, consequently the lines drawn for the coal crops near Measham have been mainly put in from information obtained during the old survey in 1854.

On the east these Coal-measures turn up very rapidly against the Boothorpe Fault, and a series of thickish sandstone beds crop out, which form a line of features that may be traced in a north-westerly direction from Willesley to Boothorpe. There are also indications of these same sandstones to the south of Willesley, but their outcrop is more obscure. There is no doubt that these beds are the same as the grit at Boothorpe. They are perfectly conformable to the Coal-measures, dipping beneath the upper part of that formation, and are not of Permian and Trias age, as was formerly supposed.

CHAPTER VI.

PERMIAN.

On the old survey of this district the Permian rocks are represented in two distinct areas—in Warwickshire and in Leicestershire. Later work in other districts, however, has thrown some doubt as to the Permian age of these Warwickshire rocks, and it is very probable that when a larger area of this county has been surveyed, they will be found to have more affinity with the Coal-measures. They outcrop in the south-west corner of the map, where they rest apparently almost conformably on the underlying Coal-measures; and form the northern part of the large patch, which has its southern termination in the neighbourhood of Warwick.

These beds were assigned by Prof. Ramsay to the Permian from their similarity to the beds of South Staffordshire*, which had been classed by Jukes as Permian. It has lately been shown, however, by Mr. Cantrill in South Staffordshire†, and by Mr. Gibson in North Staffordshire‡ that these beds are more nearly allied to the Coal-measures. If this is the case it is probable that the Warwickshire beds should also be classed with that formation. The small area of these beds that comes into this map has not furnished any evidence on the point; so that at present it must be left an open question, until the country to the south has been more thoroughly examined. In the explanation of this map it is, however, more convenient to include them under the Permian. They consist of thick beds of reddish sandstone separated by bands of purple marls and clays with here and there thin bands of limestone and calcareous breccia. Both the sandstones and the calcareous beds are very impersistent, and as a rule cannot be followed any great distance; although the former often form conspicuous features. The general dip of the beds is southerly at about 4°, but it frequently becomes more east or west over short distances. The thickest beds of sandstone are towards the base of the formation, and their outcrop forms the abrupt bank running from Bentley and Baxterley Commons westwards to beyond White's Farm, and

* Quart. Journ. Geol. Soc., vol. xi., p. 197, 1855. They had previously been assigned to the Bunter Sandstone. Trans. Geol. Soc., ser. 2, vol. v., p. 331.

† Quart. Journ. Geol. Soc., vol. li., p. 528, 1895.

‡ Summary of Progress of the Geological Survey for 1898, p. 123.

thence northwards to the western part of Baddesley Ensor; here the escarpment curves round, and continues westerly again for some distance. This sandstone has been quarried at numerous places along the escarpment, while some of the higher beds have been worked at Wickson Hill, near Baxterley Church, and elsewhere.

A thin band of limestone has been worked at Boultbee's Farm, but the outcrop does not appear to extend very far before passing into sandstone. It is possible that a good deal of the lime has been dissolved out of these beds, and that they would be found to be more calcareous at a greater depth. Calcareous beds are also seen near Lower Ridding, and in the stream below Hurley Hall.*

North of Polesworth these beds are thrown down by the great boundary fault, and crop out in the lower ground just north of the railway. Purple marls, sandstone, and breccia are exposed in the right bank of the river just east of the viaduct, and in the road a little further north. The marls appear to have been worked in old pits at the side of the footpath to Bramcote Hall and near Warton Barn; but the best exposure of the sandstone is in the quarry to the south-west of the Hall.

There are also smaller quarries on the other side of the stream; and a borehole at the Polesworth Waterworks, which are situated close to the stream, was sunk for fifty feet in sandstone. From these sections it is seen that the beds are dipping about 10° to the east, and consist of thick-bedded massive sandstones with a band of breccia in the upper part, over which there are fifty feet or more of marls before we come to the pebbly beds of the overlying Bunter.

At Bramcote these beds are cut off by a fault bringing in the Keuper sandstones, so that beds of Permian age do not appear again until we reach the margin of the Leicestershire coalfield in northern part of the map.

In this northern district these so-called Permian beds are found flanking the Coal-measures in a narrow and somewhat irregular band, and coming up through the Trias in one or two obscure inliers.

The character of the rock is very different from what it was in the south. Instead of the thick sandstones and marly bands with their intercalated calcareous beds, the rock is here mainly composed of coarse angular breccia with little marl or sandstone. These breccias, according to Mr. Horace Brown, who has made very complete analyses of the rock,† are composed mainly of fragments derived from the old Palæozoic rocks, consisting of felspathic grits and quartzites, together with slates and igneous rocks, but comparatively few carboniferous fragments. The rock from its deep purple colour, and the subangular character of the included fragments, is, when the beds are thick enough, not

* These places are just beyond the south edge of the map.

† Quart. Journ. Geol. Soc., vol. xlv., p. 24, 1889.

difficult to recognise, or to trace across the country. At the south end of the coalfield, however, these breccias appear to be thinning out, and are probably near their original limit; so that in many cases the outcrop is obscure.

Commencing on the east side, the first indications of these breccias are two small patches below Normanton. Whether the outcrop here is larger than represented we cannot say; the rock is only seen in ditch sections, and appears to have been previously overlooked. From this point it has not been observed until we reach Packington, a mile further north, where there are several sections of the breccia, in the roads near the Inn, in the stream to the south-east, in the quarry on the north side of the village, and in the conduit 350 yards north of this. Beyond this the outcrop is obscure, but may be followed on the other side of the Ashby stream as far as the north end of Willesley Park. Here the outcrop turns round to the south, and forms a fairly conspicuous feature throughout the whole length of the Park; until at the south end it either passes underneath the Trias, or is cut off by the Boothorpe Fault, which occurs is not very clear.

From this point the rock has not been observed until we get to Measham, a distance of a mile. Here it forms a considerable spread over Measham Field; but there are no sections, and the rock can only be traced from the fragments in the fields, although it has been proved in the several coalpits and borings over this ground, which show that its thickness here varies from 25 to nearly 50 feet.*

At Measham 18 yards of this rock have been proved in a well, and there is a good section of the breccia in an old quarry at the side of the Canal on the west side of the village. In an old brickyard behind the church marls have been worked, which we have classed with the Trias, but their age is somewhat doubtful. Mr. H. T. Brown gives the following section in a well at this place†:—

Well at Measham, 320 yards east of the Church.

	Feet.
Red clay	9
Sandstone	4
Clay parting -	a few inches
Breccia -	3
Red marl, with brecciated fragments	18
Blue Coal-measure clay.	

Mr. Brown calls the sandstone Lower Keuper, but there is no reason why it should not be of Permian age.

Between here and Oakthorpe the outcrop is rather uncertain, but a good deal of light has lately been thrown on the structure of this district by the borings and shafts put down by Mr. S. H. Leech for the Measham Terra Cotta Works, who has found the breccia and marl to have a thickness of 27 feet or more. From these shafts, which are between 600 and 700 yards west of the north end of Measham, the breccia may be traced by the nature

* These sections will be given in the general memoir on the coalfield.

† *Loc. cit.* p. 11.

of the soil to the Springfield shaft at Oakthorpe, where 18 feet of the rock were proved. At this village it again forms a hard compact rock, and crops out along the Canal, the wall of which has been built of this stone.

On the opposite side of Saltersford Brook the breccia is seen at the spring, and in the railway cutting near Hall Farm ; and the outcrop may be followed across the village of Donisthorpe to the Hooborough Brook, on both sides of which it forms a conspicuous feature.

South of Overseal the outcrop is broken by a fault, but, passing to the east of the village. the rock forms a good feature along the crest of the hill, that may be followed for some distance. Wells in the village show a considerable thickness of breccia.

CHAPTER VII.

TRIAS.

Bunter Sandstone and Pebble Beds.

The only representative of the lower part of the Trias which occurs in this district is that of the quartzose Conglomerate or Pebble Beds, which further west, in Staffordshire, constitutes the middle portion of the formation. These Pebble Beds consist of partially consolidated quartzose gravels, which pass upwards into alternations of more or less pebbly sandstone. The pebbles are covered with numerous small indentations caused by pressure or chemical action, where they are in contact.* They are, for this reason, easily distinguished from the Drift pebbles, which are never so indented. The latter also frequently have their longer axes vertical, which is not the case with those in the Bunter. The matrix of these old gravels is, in many cases, so hard and consolidated that they fracture more readily across the pebbles than between them.

These beds probably have a maximum thickness of about 1,000 feet (854 feet were found in the boring at Chilcote); but over most of the ground, where they crop out, the thickness does not appear to be so much, and towards the east they gradually thin away altogether. The upper part of the formation consists mainly of coarse sandstone with only scattered pebbles or lumps of quartz; which it is difficult to distinguish from the overlying Keuper Sandstone, and consequently the upper limit of these beds is somewhat arbitrary.

In the southern part of the map the only outcrop of these beds is an area of about a square mile between the faults at Warton and Polesworth. They are, however, well exposed over this ground and sections are frequent. The best exposure is that in the railway cutting at Hoo Hill east of Polesworth, where there is a continuous section nearly half a mile in length. The Bunter here consists of thick beds of conglomerate with several bands of sandstone; the lower part of the formation consists almost entirely of conglomerate, while in the upper part the sandstones gradually become less pebbly until they seem to pass into the higher sandstones, almost devoid of pebbles, which have been classed with the Keuper, although no actual junction is seen.†

On the north side of the river these beds form the somewhat conspicuous hill called Bury Hill.‡ Here the pebble beds and soft sandstones are seen at frequent intervals along the different roads and in the quarries round the hill. The general dip of the

* Figures of these pebbles are given by W. S. Gresley and T. Mellard Reade. Geol. Mag., dec. iv., vol. ii., pp. 239 and 341, 1895.

† The recent widening of the railway here shows that the whole cutting is in Bunter, and that the junction is further east, as shown on the map.

‡ "The Round Berry" on the new Ordnance Survey.

beds is south-east at angles varying from 9° to 25°, except at the north end of the hill, where they turn over towards the north, and dip at a rapidly increasing angle into the fault, which bounds them on this side. North of this they disappear under the overlying formations for some distance until they crop out again along the valley of the Mease between Netherseal and Measham.

At Measham these sandstones are seen in the railway at the station, and in quarries to the south; but both their upper and lower boundaries are here rather obscure. They are, however, not very thick here; it is probable that this is near their limit, and that they thin out a short distance to the east.

There are indications of these beds on the south side of Oakthorpe, but their outcrop is not very clear until we reach the stream coming down from Willesley. Beyond this the Pebble Beds become much thicker, and are very conspicuous over the hill to the south of Donisthorpe, and thence across the Hooborough Brook to Netherseal and Overseal. Here they form a range of gravelly hills, in striking contrast to the more clayey measures on either side.

West of Overseal there is a sharp junction with the Keuper sandstone and included marl bands, which was formerly supposed to be a line of fault, but which we now consider to be due to the unconformable overlap of the newer formation. The Pebble Beds rise up again to the west, and form the poor land at Seal Wood, where the junctions with the Keuper are equally sharp.

At the time of the old survey these abrupt terminations to the outcrop of the Pebble Beds were thought to represent mostly lines of fault, and that the Keuper was let down by three more or less parallel faults. Since then mines have been driven under a large part of this ground, and it has been found that the coals are not broken at these places. This being the case, these sharp lines of boundary must be caused by the Keuper lying unconformably in hollows of the Pebble Beds, and abutting against the ridges formed by them.

Lower Keuper Sandstones and Marls.

This formation has an average thickness of about 100 feet on the east side; but on the west it appears to be about 150 feet thick, although in places it may be somewhat greater. It consists of massive beds of soft sandstone, sometimes white but generally stained red or brown. These sandstones are split up by numerous beds of marl; they are generally false-bedded, and frequently ripple-marked. In the country to the north at Castle Donington, and also to the south in the neighbourhood of Warwick, footprints of *Labyrinthodon* have been found in these beds, but we are not aware of such being the case in the area now under consideration. The basement beds of these sandstones contain many quartz pebbles, and in some places hard beds of conglomerate. The following section in Heather brickyard shows the general character of the lower part of the formation.

Section in Heather Brickyard (north of station).

	Ft.	In.		Ft.	In
Drift Gravel					
Red marl				10	0
Sandstone	1	0	to	3	0
Hard red marl with specks of mica	10	0	to	11	0
Yellow sandstone				3	0
Hard red marl (becomes more sandy further east)				3	0
Yellow sandstone				1	0
Hard red marl				6	0
Conglomerate, very hard in the centre of the pit, soft and decomposed to the east				1	6
Sandstone				3	0
White and grey shales of the Coal-measures					

The beds undulate and split up. There is more sandstone on the whole in the south-east part of the pit.

The upper beds pass very gradually into the overlying marls, so that the boundary between them is difficult to fix, especially in pit sections or borings.

In the south of the map the Lower Keuper Sandstone comes to the surface in a narrow strip along the line of the fault south of Atherstone. It is seen in an old sand pit at the edge of the Outwoods, and in others in Merevale Park. The beds here are so soft and unconsolidated as to be dug for building sand; they are also very coarse, especially in Sand Hole Spinney, where some of the pebbles are as much as two inches in diameter.

The beds in both these places have been worked up against the fault; by which they have been turned up very sharply and dip at 20° to the north.

On the west side of Merevale Park the sandstones have also been worked in Old Lane Spinney and at the Church, but the beds are not nearly so coarse as they are in Sand Hole Spinney.*

Beyond the Merevale Valley the Lower Keuper Sandstone is covered by marls, which here abut against the fault for a short distance; but it appears again just beyond the Watling Street and is seen at many places about Dordon Farm and Dordon Hall.

At Warton the sandstones are tolerably massive, and were formerly somewhat extensively quarried. They dip at the rather high angle of 9° to the north-east and east, which is probably caused by the proximity of the fault on the south side of the village. Beyond this the beds become flatter and the outcrop widens out considerably, covering the whole of the low ground between Austrey and Seckington, although much hidden by the later deposits of the Austrey Meadows. The lower and more massive beds are well seen at Seckington and Newton Regis; in the latter village great floors of rock are exposed near the Church.

At Austrey the flaggy upper beds are seen in many of the lanes, and the gradual passage into the marls may be followed up the stream to the east. In consequence of this gradual passage

* It is possible that these latter are a portion of the Pebble Beds brought up by the fault.

it is not very easy to fix the line of boundary with the true Keuper Marl; and we have drawn it between here and Appleby, at a somewhat higher horizon than that shown on the old map, which appears to cross the line of strike. The measures which we now include with the lower formation contain thin bands of sandstone that are somewhat different in character from those occurring in true Keuper Marl. Moreover, the Keuper Marl, east of Austrey and No Man's Heath, rises in a sharp bank above these measures, and forms a good physical feature, that is very abrupt and easier to follow than the horizon formerly adopted.

Between Shuttington and the Mease the Lower Keuper Sandstone covers a large area of country, and consists of beds of sandstone and marl, which occasionally form good features; but frequently, the sandstones becoming thinner, these die out, and no divisions can be drawn. In many places the marl predominates to such an extent as to give the country the aspect of that of a true Keuper Marl. This was, no doubt, the reason for the greater area of this formation shown on the old map.

North of the Mease the outcrop splits up into two horns flanking the Coal-measures on either side. The western of these forms a somewhat narrow outcrop to the west of Netherseal, which is broken by the Gunby Lea fault at Grange Wood, and fills the hollow between here and Overseal. This was shown on the old map as Keuper Marl; but, although in places the ground is very marly, there is a considerable amount of sandstone to be found over the area, certainly far more than ever occurs in the Keuper Marl.

At Netherseal Colliery the upper limit of the sandstone is obscured by Boulder-clay, but it probably runs against the large north and south fault somewhere to the south-west of the pit.

The outcrop on the eastern side of the coalfield covers a broader area to the east of Measham, part of which runs up in a promontory to the high ground above Willesley Park, while part passes by Snareston and Swepstone to the escarpment at Normanton, and thence by Alton Grange to the Midland Railway at Breach Hill. The formation here resting principally on Coal-measures, its base is better defined; and, the passage of the marls not being quite so gradual, the upper boundary is also more distinct. These sandstones are seen in some of the brickyards at Measham, in Willesley Park, and along the bank from Snareston to Breach Hill, where there is an extensive section in the railway showing the usual pebbly beds at the base.

Keuper Marl.

The Keuper Marl covers the largest area of surface of any formation with which we have to deal. It overlaps unconformably the rocks beneath; and, although along its junction with the Lower Keuper Sandstone, it succeeds that formation quite regularly, in fact, the one passes into the other by almost insensible gradations; still, where the oldest rocks come to the surface as around Charnwood Forest and at Enderby and Croft, it abuts directly against them without any intervening beds of

Lower Keuper Sandstone, showing that these older rocks must have stood up as islands in the waters by which the Trias was deposited.

These beds consist of red and mottled marls with thin beds of grey and white sandstone, known as skerry; which at two horizons, one near the top the other near the base of the series, thicken out locally into sandstones of some importance. Thin beds of gypsum also occur at intervals throughout these marls, as shown by several of the borings in them; but these bands are not so thick as in the higher part of the formation which crops out to the east, and consequently they are not very apparent at the surface.

The Keuper Marls occupy principally the southern and eastern portions of the map, but being largely concealed by Boulder-clay and other Drift deposits they are mainly to be found along the valleys which have cut through these later beds; although they also come to the surface somewhat extensively around the Charnwood Hills and in the low ground north and east of Atherstone, where there is very little Drift.

At Orton-on-the-Hill the sandstones near the base of the marls thicken out for some distance to the north and south of the village. There is not one mass of sandstone here, as shown on the old map, but there are five or six different bands separated by beds of marl, which form distinct features that may be followed from the low ground near Sheepy to Orton, and thence along the escarpment behind Austrey to No Man's Heath, where they turn round and gradually thin out again in the bank to the south of Appleby. There are indications of this sandstone at Norton, Shackerstone, and at Carlton Bridge, but it cannot be traced across the country from these places.

In the upper part of the marls a similar bed of sandstone is seen in the Leicester and Burton Railway just beyond the edge of the map. This is much more massive than that at Orton, but it also appears to thin out very rapidly in all directions. There is a considerable spread of sandstone at Narborough Wood House, and a band of from six to ten feet thick is seen in the quarry at Croft, which are probably the continuation of this upper sandstone.*

Over the area between the two coalfields of Warwickshire and Leicestershire the Keuper Marl has been entirely denuded for an average breadth of about three miles. It comes on again in the north-west of the map about Thorpe Constantine, Clifton Campville, and to the west of Netherseal, where it forms the eastern edge of the great mass of marl that stretches away to the Trent and beyond. Here it forms very similar country to what it does in the east, the higher ground being capped with thin Drift, while the valleys are cut in a uniform red marl without much sandy material of any kind.

* This has been called the "Upper Keuper Sandstone"; but, as in this district the bands of sandstone are very inconstant and occur at different horizons, they do not deserve a special name.

CHAPTER VIII.

PLEISTOCENE AND RECENT.

Glacial.

The Glacial beds, which come into this map, are in general not so thick and important, nor are the sub-divisions so clearly defined as they are further to the east along the valley of the Soar. Near Leicester there are three distinct Boulder-clays and associated gravels which are easily distinguishable from one another. An older clay containing quartzite and pre-Carboniferous pebbles mixed with fragments derived from local rocks; a newer clay, containing fragments of Chalk and Oolite, also mixed with local fragments; and lastly a still newer clay which is much more gravelly than the other two, and occurs along the valleys and lower ground, while the two older clays generally occupy that above.

In this district the same divisions probably to a certain extent exist, but the Drift being generally thinner the distinction between the several divisions is not so marked and they cannot be made out with any approach to accuracy. The Drift over this ground as a whole is more sandy or gravelly than further to the east, and, except along a north and south line across the centre of the map, there are no very thick deposits of Boulder-clay. Very few fresh sections in Boulder-clay have been exposed during the progress of the Survey; but from what has been seen it appears that the clay principally consists of local materials mixed with well-rounded quartzite and other pebbles; and generally contains, but not always, some fragments derived from the Jurassic rocks and Chalk, the latter in many places being so numerous as to form a regular Chalky Boulder-clay.

The thickest mass of Boulder-clay is, as we have said, along the centre of the map from the neighbourhood of Market Bosworth southwards. There is also a considerable amount at Hugglescote; where in a well over thirty feet of Chalky Boulder-clay was found resting on the gravel. Whether these two deposits originally occupied the same valley or depression in the Keuper Marl is not very clear, but they are probably more or less connected, as the Drift occurs at a lower level than elsewhere along a line running from the flanks of the Charnwood Hills near Coalville, by Hugglescote, Heather, Carlton, Market Bosworth, Shenton, and Stoke Golding. From Market Bosworth southwards it sinks below the present level of drainage, and appears to attain its maximum thickness. At the Cowpasture boring, to the north-east of that place, there was 40 feet of Boulder-clay, at Bosworth Wharf there was 27 feet, and at Kingshill over 100 feet, which shows that it descends considerably below the bottom of the present valleys. At all these places it also occurs along some of the

lowest ground near the railway from Shenton southwards; it is also of great thickness to the eastward as far as Stapleton and Barwell, and southwards as far as Hinckley*, the solid rocks not having been seen at the surface anywhere throughout this region, although the present valleys are fully 60 feet below the general level of the country.

At Bosworth Wharf, Shenton, Stoke Golding, and further south a great part of the clay is free of stones, and is more of the character of a brickearth, containing sandy and loamy bands and a great profusion of the small calcareous lumps known as "race." Sections in this clay are exposed in the brickyards at Osbaston Lount, Hoo Hills, Bosworth Wharf, and Shenton, and in the railway cuttings near here and further south. At Osbaston Lount the clay is said to have been proved for 40 feet beneath the present valley. Intercalated in the clays are many beds of sand and gravel, which crop out along the flanks of the hills, or cap their summits, as shown on the map. These are sometimes dovetailed together with the clays, and are very irregular in their outcrop, more especially at Hugglescote, Barleston, Hoo Hills, Coton, Stoke Golding, and Stapleton.

West of this there is a broad tract of country occupying the greater part of the west half of the map, over which there is little or no Drift except along the flanks on either side.

This ground, which extends from Atherstone to Ashby-de-la-Zouch, is formed mainly by the outcrop of the Lower Keuper Sandstone, flanked on either side by the overlying marls, except at the northern and southern extremeties, where the Coal-measures crop out. Along the centre of this axis there is no Drift; but on either side isolated patches of gravel and gravelly clay are found over the higher ground, that on the east being clearly the attenuation of the thicker Drift mentioned above, while that to the west apparently belongs to deposits occupying the Trent Valley, although the Survey has not as yet been extended far enough in that direction to show the connection. These latter beds, which cap most of the hills in the north-west corner of the map, consist mainly of gravel; but there is one section at Netherseal Colliery which shows good chalky Boulder-clay interbedded with laminated clay or brickearth.

On both sides of this axis there is a good deal of thin Drift which is not light enough to be mapped as gravel, and is, therefore, shown as Boulder-clay. It is probably, in many cases, merely a remnant of gravel on a clay subsoil.

The principal areas of gravel in the eastern part of the map occur along a line running from Ravenstone to Heather, Nailstone, Barleston, Newbold Verdon, Desford, Peckleton, Kirkby Mallory, and Earl Shilton. This nearly coincides with the watershed between the Soar and Anker.

There is also a considerable amount of gravel at Twycross, Dadlington, and near Ratby.

* At Hinckley the Drift is stated to be 150 feet thick.—Brit. Assoc. Reports for 1875, p. 136, and 1879, p. 160.

These gravels, when they occupy a low position relative to the Boulder-clay, are generally composed of quartzite pebbles and other rocks derived from the west; but the older gravels were so irregularly distributed, or were so greatly denuded before the deposition of the overlying Drifts, that their position is often occupied by gravels of more recent date derived from the east. At the present time, owing to the general use of many of the older rocks for road material and ballast, there are very few good sections of gravel; and without a clear exposure, from the mingling of the overlying beds with those below, it is very difficult to determine one set of gravels from the other. The pebbly gravel principally occurs at Ravenstone and Heather, in the north of the map, and at Newbold Verdon, Desford, Kirkby Mallory, Peckleton, Earl Shilton, Huncote, Kirkby Muxloe, Ratby, and Ambion Hill in the south; while the more or less chalky gravel is found at Bagworth, Market Bosworth, Dadlington, Stoke Golding, East Leicester Forest, Enderby, and Narborough. The best section in the former is in Heather brickyard, and in the latter at Dadlington.

In the west of the map there are patches of gravel at Warton, Shuttington, west of Thorpe Constantine, Clifton Campville, Lullington, and Coton Park. These, with the exception of that at Coton Park, which contains flints, are all composed of pebbles without any admixture of eastern rocks. When they overlie the Pebble beds of the Bunter, as at The Round Berry, near Warton, they are rather difficult to separate from that formation; but the pitting of the older pebbles, as mentioned in Chapter VII., is a fairly safe guide by which to distinguish them.

In the north of the map there are two curious troughs or erosions in the solid strata that have been filled with Boulder-clay. These were crossed by the railway north of Ravenstone, and are well shown in the cuttings 500 yards and 840 yards west of the bridge at Sinope. They are from 100 to 150 yards in breadth, and contain beds of gravel, composed of Chalk flints and Oolite fragments mixed with pebbles, which have been cemented into a hard conglomerate, that is seen in the railway cutting where it crosses the eastern trough. This latter appears to coincide with the position of the Coleorton Fault; and it probably owes its existence to erosion or subsidence along that line.

Besides the Boulder-clays and gravels derived from the west and east just described there is a later Drift, which is found along the existing valleys. This varies from a clay to a sand or gravel; but is generally a mixture of the two, which can scarcely be called either a clay or a gravel. It is never of any great thickness, frequently forming little more than a stony soil over the underlying strata, and constantly merely filling pipes and hollows in these beds; so that, when there are few sections, its thickness is very deceptive. It contains materials derived from both the older Drifts; and when it abuts against these it is impossible to separate one from the other.

These beds form the more or less detached patches shown along the principal valleys of the district; and were deposited

when these were nearly cut down to their present level. They evidently mark a very late period merging into the time when the terraces of the existing rivers were laid down; and consequently the separation of them from the river beds, in some cases as along the Anker and the other larger streams, is purely arbitrary. They, in fact, form a connecting link between beds of truly glacial age and the alluvial deposits of the present rivers.

River Gravels and Alluvium.

Intimately associated with the beds last mentioned are the deposits of gravel and loam which have been left along the courses of the main streams. These are found in the valleys of the Anker, the Soar, and their principal tributaries; where they form more or less distinct terraces above the modern alluvium of the river.

Along the flanks of the Anker there are two or perhaps three of these terraces, marking the level of the river in former times. The distinction between the several terraces is usually well-marked towards their upper end, but lower down the valley they are blended with one another, and it becomes difficult to separate them.

The higher of these terraces is the most indistinct, and, as we have said, joins on to beds of apparently late glacial age, so that it is doubtful how they should be represented on the map. Of this character are the patches of clay and gravel shown along the valleys near Shackerstone, Sheepy, Newtown Unthank, north of Earl Shilton, near Measham and elsewhere.

Besides the narrow strips of modern alluvium, which flank the larger streams, and are liable to be flooded by them, there are some considerable tracts of alluvial loam and peaty soil, which occupy depressions that were formerly lakes or swamps, but have been drained by the cutting down of the small streams, which connect them with the main valleys. The principal of these is that known as Austrey Meadows, which has a length of over two miles, and covers an area of about 1,300 acres. There are also smaller patches near Orton, Sheepy, and along the higher reaches of many of the streams, as around Shenton and other places.

CHAPTER IX.

FAULTS.

The Polesworth Fault.

We have given this name to the large fault that forms the north-east boundary of the older rocks of Warwickshire, in order to distinguish it from that other large dislocation which forms the north-east boundary of the Leicestershire coalfield; and on account of its existence at Polesworth as a fault being clearer there than elsewhere. This fault runs in a north-westerly direction from beyond Nuneaton to Atherstone, and thence to Polesworth and Shuttington. There is no means at present of estimating the displacement caused by this fault, as the thickness of the strata to the north-east is not known. It is, however, probably greater here than to the south-east about Nuneaton, where Mr. Strahan has stated that it is not of the importance that was supposed.* The nearest places at which the underlying measures have been proved is at Lindley Hall, which is two miles from the line of fault at Caldecote. Here the base of the Trias is supposed to have been reached at 660 feet. In the town of Nuneaton, close to the line of fault, the depth was 110 feet; whereas at Stretton Baskerville, and Hinckley Wharf, further to the east, it was 623 feet and 744 feet respectively. South of Atherstone this fault cuts off the Cambrian shales and intrusive igneous rocks very sharply, and brings down the sandy beds of Trias against them. The line of junction may be seen in the sand pit at the edge of the Outwoods, and in that in Merevale Park on the west side of the drive to the Hall; both of which have been worked up against the shales on the south side. At the latter place the line of fault makes a very sharp bend, almost at right angles, although it soon recovers the same general direction; and, passing in a well-defined line through Merevale Church, is continued to the north of Waste Hill. Its course through Dordon is more northerly; but its position is still sharply defined, especially at Dordon Hall, where the Coal-measure shales and Triassic sandstones are seen on opposite sides of the lane.

At Polesworth, Mr. Howell states that "this fault was proved in working the Seven-feet coal in a pit, which was sunk close to the barn, on the east side of the railway cutting between Polesworth station and the bridge over the railway between Polesworth and Waverton. The coal was here sixty yards deep, and was wrought up to the 'Red Rock fault,' which cuts off the coals

* Geol. Mag. dec. iii., vol. iii., p. 553. At Nuneaton the junction between the Keuper and the older rocks is very probably, to a great extent, a line of unconformity.

altogether to the east."* North of this it passes Woodside Farm, and is lost beneath the Drift capping the hill at Shuttington.

Bramcote Fault.

We give this name to a small branch of the last which passes to the south of Warton, and brings the Permian and Bunter beds against the Lower Keuper Sandstone, the general displacement of the beds near Bramcote Hall being very striking. To the west this fault probably joins with the Polesworth fault, and terminates the outcrop of the Coal-measures at Shuttington; but its exact position cannot be fixed, beyond the fact that Coal-measures are seen at the village, and red marls a little to the north. On the old survey this fault is represented as curving round to the south, and uniting with the main line of fault near the Watling Street. We could find no evidence of this; the Pebble Beds appear to dip quite regularly beneath the Lower Keuper Sandstone, and this latter beneath the marls; while the high dips in the quarries at Warton are probably caused by the proximity to this fault.

Monk's Park Fault.

There is probably a north and south fault intersecting the Cambrian beds at the Lake to the east of Merevale Hall. The principal evidence for this is, however, in the next map in Monk's Park Wood, where it throws down the Coal-measures to the west. "Its direction is about north and south, and the coals are thrown down to the west nineteen yards, the whole of the coals on the west side of the fault being shifted considerably to the north. This fault was proved in the workings of the Four-feet coal at Oldbury, which coal was found to have been thrown down to the west nineteen yards. The position of the fault further north was proved by numerous borings, all of which were on faulted measures. It also affects the Permian rocks in a similar manner, and can be seen in a quarry by the side of the lane between Monk's Park and Spodes Rough."†

Baddesley Fault.

In the south-west corner of the map we have shown a fault, about which we have some doubt. The principal evidence for there being a fault here is the sudden termination of the outcrop of the bands of limestone, and the disruption there also appears to exist in the "Permian" sandstones. The limestone, which forms a conspicuous feature from Baxterley Park as far as Cowper's Grove, suddenly terminates at this point; and the outcrop, which is probably in lower ground beyond, is not traceable. Similarly the base of the sandstones forms a good feature as far as Ash Spinney below White's Farm, where it is suddenly thrown down to lower ground, and the line of strike changes. At this point there are some old pits in which the limestone has been worked against the edge of the sandstone, which a little further on in the quarry near the old barn is seen to be dipping at 4° towards the fault.

* Warwickshire Coalfield, Survey Mem., p. 13.

† Ibid. p. 51. Mr. Smallman informed us that a pit, lately sunk south of Spodes Rough, shows that this fault is rather further west than drawn on the map (63 S.W.).

It is probable that the evidence for this dislocation will be clearer when the country further to the south-west, about Hurley, is surveyed.

Hall End Fault.

In Birch Coppice Colliery, at Hall End, a fault has been proved running almost in the position of the Watling Street, and having a throw of 25 yards down to the north. This must shift the outcrop of the coals in the valley south of Birch Coppice; but, owing to the general high dip here, its effect is not very conspicuous.

Several other faults, varying in throw from 10 to 30 yards, have been proved in the mines between here and the river Anker; while in the Baddesley Pits the measures are almost undisturbed, thus showing that the Coal-measures are much more broken as they approach the great east and west boundary faults enclosing the apex of this coalfield.

The short branch fault shown at Polesworth, having a down-throw to the west of from 10 to 40 yards, has been transferred from the old survey. The coal pits here have been abandoned many years, and all evidence in the matter has been lost.

The fault shown on the old map (62 N.E.) as running west from Polesworth has been found by the workings at Pooley Hall to have no existence at the Hermitage, and is consequently now omitted.

The great fault which bounds the Warwickshire Coalfield on the west side is probably continued as far as the valley west of Shuttington, and meets the east boundary fault; but there is no evidence for its being continued further north past Seckington, or for its being the same as the Stonewall Fault in the Donisthorpe coalfield as supposed by Coleman*. If these faults are connected they do not appear to have affected the overlying Trias. The marl at Seckington rests quite regularly on the thick sandstones beneath, and is not faulted against them as has been supposed.

In the northern part of the map the principal faults all run in a north-west and south-east direction parallel with the axis of the Charnwood Hills. There are also many running at various angles to these, but they are not so large or important as the former.

The Eastern Boundary or Thringston Fault.†

The largest fault in this district is that which bounds the Coal-measures on the east side. It enters the map at Whitwick, and has been proved on the east side of the colliery as far as Broom Leys, from whence it probably continues by Bardon Hill Station to Thornton and Desford, although the collieries near here have not as yet worked far enough east to obtain any

* White's History of Leicester, p. 93.

† We have adopted this name from Coleman. It is called the Coleorton Boundary Fault by Prof. Hull (Leicestershire Coalfield, p. 52), but as there is another fault much nearer Coleorton we reserve that name for the latter.

evidence of it. It may, however, have been touched in the Lindridge sinking, where the Coal-measures were much shattered, and "slaty rocks" were met with. In the Whitwick Colliery this fault is reached at about 1,000 yards to the north-east of the pit, where the measures begin to rise very rapidly until they become almost vertical. This fault causes a displacement of over 2,000 feet. The bending up of the Coal-measures caused by it is very rapid; as only about sixty yards from where they are nearly vertical they begin to rise in the opposite direction at about 5°, forming a synclinal trough parallel with this disturbance.* A large fault, shown on Hor. Sect., Sheet 46, called by Mr. Coleman the Hugglescote Fault, has been supposed to run at right angles to this fault along the northern foot of Bardon Hill. If such a fault exists it is of a pre-Carboniferous age, and does not appear to affect the Coal-measures in the least. In the South Leicestershire Colliery, which has worked across this line, there is no evidence of such displacement; and the coal seams in the other collieries on either side are more or less at about the same level.

The Coleorton Fault.†

This fault appears to bound the eastern division of the coal-field on its western side. It is more easily traceable in the map to the north, where it has been found to sharply cut off the outcrop of the coal seams. In this map it is entirely concealed by the Trias and Drift; but its direction is probably indicated by the troughs filled with Boulder-clay which are seen in the railway cutting west of Sinope.‡ At about 900 yards south-west of the colliery here the coal was found very tender and full of water, probably owing to the proximity of the fault; but its throw cannot be very much here, if we are right in supposing that the coal worked at Alton was the Roaster seam. The faults at Heather of 20 to 25 yards and 9 yards are possibly the continuation of this fault. They were proved in the colliery here, and their effect at the surface is to bring down the Keuper Sandstone into the stream for a short distance.

The Ashby or Anticlinal Fault.

Prof. Hull, in the old map of this district, has shown the axis of the anticlinal as a doubtful line of fault, and the same idea is entertained by Mr. Coleman. It is very probable that this is the case, but during the present survey we have not been able to obtain any evidence to prove whether the strata are really shifted along the axis or not.

The Boothorpe Fault.

This is the second largest disturbance in the district, and is estimated to have a throw of at least 1,000 feet. It forms the boundary between the workable seams of

* Hull, loc. cit., pp. 37, 45, 53. Mr. Coleman, loc. cit., p. 82, mentions an outcrop of Bardon rock considerably to the west of this fault. This may have been a drifted mass, as we could find no trace of such a rock at the place named.

† Heath End Fault of Hull, loc. cit., p. 52.

‡ See p. 39. Also Coleman, loc. cit., p. 89.

Moira and the more or less barren measures of Ashby. It is best seen at Woodville, just beyond the edge of the map; but is not difficult to trace in this sheet, having caused considerable disturbance in the measures that are exposed in the railway cutting north of Willesley Wood. It runs near the southern edge of Willesley Park, where the Main Coal, which probably crops out beneath the Triassic Sandstone here, is found to be sharply bent up. This fault probably bounds the workable seams of coal a short distance north of Measham House, but there is no evidence as yet to fix its exact position.

Moira Main Fault.

Throughout the Moira Coalfield there are a large number of faults that have been proved in the different collieries. The principal of these is that known as the Great Moira, Moira Main or Mammatt's Fault, which in the Rawdon pit has been proved to have a downthrow to the east of ninety-four yards. This fault, to the north of the railway, runs nearly parallel with the Woodville Road; but south of this curves round more to the south towards Donisthorpe, and appears to become split up in the large number of faults which occur about there. It does not continue on in a south-easterly direction towards Oakthorpe and Measham, as was formerly supposed. This ground has now been worked under, and no throw of any size has been met with.

Stone Wall Fault.

Near the cross-roads east of Donisthorpe, there is a fault running in a south-west direction, which is probably the same as that to which the above name has been given. This fault is stated by Prof. Hull to have been proved in the Donisthorpe old mines, where it had a downthrow to the north-west of 100 yards. Mammatt, in one of his sections, shows a fault in about this position having a throw of from 120 to 140 yards up to the east; but the later colliery workings have not gone through it, so that we are unable to verify these statements. This fault probably runs from the much broken ground near Brambro Farm down the valley, between Oakthorpe and Donisthorpe.

Over the ground to the west of Overseal faults are shown on the old survey, which recent mining operations have proved do not exist; and therefore the sharp junctions here between the several divisions of the Trias are not due to faulting, but are rather the result of the unconformity of the Keuper Sandstone on the Pebble Beds of the Bunter. The principal faults, over this area, which have been proved in mining or by boring, are a large north and south fault, a little west of Netherseal Colliery, which has a downthrow to the west of 250 yards or more; another between this colliery and Overseal, which has a downthrow to the west of seventy-four yards, and a third east and west fault, which we have called the Gunby Lea fault.

The Gunby Lea Fault.

This runs nearly along the road at the south of Grange Wood, and has a downthrow to the north of 96 yards. It appears to

shift the boundary of the Triassic beds, as shown on the map, and it is interesting from the effect it has on the waterbearing capacity of the Keuper Sandstone. At Gunby Lea this fault is exactly in the line of the road, and forms an impervious wall to the water, so that a well 29 feet deep on the north side of the road is full of water almost to the surface, while one recently sunk to a depth of 40 feet exactly opposite is completely dry.

At the south end of the village of Overseal there is a fault which is probably the continuation of this last. It has been proved in the mines to have a downthrow to the north of 20 yards, and its effect at the surface on the Trias and Permian is very marked.

Measham Fault.

Between Oakthorpe and Measham the old survey shows an east and west fault called by Prof. Hull the "Oakthorpe Fault."* Subsequent working in this district have afforded evidence that this fault has not the direction shown on the map, but that it runs more southerly and closer to the village of Measham. At a point about 500 yards west of the village the Main Coal has been found at the surface and dipping to the north, whereas it is stated to be 42 yards deep at the village.† It is, therefore, evident that there must be a considerable fault to the north and west of Measham, but running in a more southerly direction than shown on the old map.

Oakthorpe Fault.

On the south side of the village of Oakthorpe there is a north-west and south-east fault which cuts off the Coal-measures in the low ground beyond the railway. It has not been proved in any working, but the juxtaposition of the Coal-measure shales and the sandy beds of the Trias near the railway bridge seem to show its direction pretty clearly. This fault probably joins that of the Stonewall Fault mentioned above somewhere in the valley of the Saltersford Brook.

On Measham Field the borings along the old tram road‡ proved a fault which threw out the Main Coal to the south. This may be a continuation of the Oakthorpe Fault, as other borings tend to show that the coal is absent to the south of Measham.

There are several other faults throughout the Moira and Donisthorpe coalfield, which have been proved in the various mines and are shown on the six-inch maps. One very large one, the throw of which is doubtful, occurs in the Donisthorpe Colliery. This coalfield is very much disturbed and broken up, the disturbance evidently increasing towards the west, as the measures in the Netherseal Colliery are excessively irregular, and the direction of the dip changes about in a marvellous manner.

* Memoirs of the Geological Survey. The Leicestershire Coalfield, p. 49.

† Further evidence on this point will be given in the general memoir on the coalfield. Mr. S. H. Leech, of the Measham Terra Cotta Company, has given us much valuable information on this district.

‡ The details of these will be given in the general memoir.

APPENDIX I.

*Sections in the Northern Part of the Warwickshire Coalfield.**

Baddesley Colliery, Baxterley.

STRATFORD PIT.

From Rev. W. H. Coleman's MSS.†

	Thickness.		Depth.	
	Ft.	In.	Ft.	In.
Soil	1	0		
Clay	4	0		
Bind	6	0		
Clunch bind	7	6		
Stone	2	3		
Clunchy marl	6	0		
Ironstone		3		
Clunch	9	0		
Stony bind	19	6		
Marly bind	16	6		
Stony bind	12	0		
Marly bind	7	6		
Open stone	15	0		
Sharp stone Stone and cank balls	5	4		
Coarse rock	13	6		
Hard stone	15	0		
Tender bind	6	0		
Limestone	2	6	148	10
Clunchy stone	5	0		
Sharp stone	10	0		
Sandy rock	30	6		
Dunns	16	6		
Strong bind	4	0		
Hard stone	22	2		
Clunchy bind	11	6		
Strong clunchy bind	7	0		
Stone		7		
Bind	4	1		
Stone	10	4		
Sharp stone	14	0		
Stone bind	1	0		
Cank	30	0		
Stone	8	0		
Clunchy bind	10	0		
Stone	12	8		
Tender bind	14	3		
Red stone	10	6		
Bind	16	9		

* The sections in the Leicestershire Coalfield will be given in a general memoir on that district.

† We are indebted to Mr. P. B. Mason, of Burton-on-Trent, for the use of these manuscripts.

——	Thickness.		Depth.	
	Ft.	In.	Ft.	In.
Stony bind-	4	6		
Dunns -	7	3		
Clunchy bind	5	6		
Stony bind-	10	3		
Hard stone -	6	0		
Tender dunns -	4	0		
Stone and cank -	7	0		
Stony bind	4	8		
Grey stone-	14	0		
Stone- -	5	0		
Stony bind -	9	0		
Fireclay	3	0		
Bind - -	1	3		
Stony bind-	6	0		
Stone and cank -	6	7		
Blue bind	4	0		
Stone bind-	10	0		
Stone and cank -	8	4		
Hard stone	6	0		
Clunchy bind	3	0		
Stone and bind -	4	0		
Rattlejack -		9		
Stony bind	2	0		
Hard stone	3	0		
Clunchy bind	4	8		
Fireclay-	6	0		
Coal, soft	1	6	534	11
Bat and sloom	1	6		
Coal, soft-	1	3	537	8
Tender bat	1	3		
Dunns	4	6		
Sharp stone	1	0		
Stony bind	4	10		
Ironstone balls		4		
Stony bind	6	0		
Bind -	2	0		
Dunns and bat	3	8		
Coal, soft	1	6	562	9
Dunns	1	0		
Coal, soft	1	0	564	9
Dunns	6	6		
Measures* -	112	6		
Coal, Four Feet Coal	4	4	688	1
Measures	49	2		
Coal, Rider Coal	8	6	745	9
Parting -		9		
Coal, Bare Coal	5	6	752	0
Measures	58	0		
Coal Slate Coal	4	6	814	6
Measures -	102	0		
Coal, Seven Feet Coal	5	6	922	0
Fireclay (Dark grey tender dunns)†	3	0		
Blue bind (Clunchy bind) -	9	0		
Coal (Soft dicey) -	1	3	935	3
Fireclay (Dunns and bat) -	4	0		

* The details of the section below here are not given by Mr. Coleman but may be fonnd in the vertical sections of the Geological Survey, Sheet 21.

† The additions within brackets are from the sinker's account.

——	Thickness.		Depth.	
	Ft.	In.	Ft.	In.
Coal (Soft)- - -	1	6	940	9
Fireclay (Soft light grey sloom)		3		
Coal (Soft dicey) - -	1	0	942	0
Fireclay (Drab and grey sloom or duns) -	3	0		
Ironstone balls (large brown and shot with white spar) - - -	1	0		
Bind and ironstone (Sharp hard blue bind with yellow ironstone)	21	7		
Ironstone balls (brown) - -		4		
Blue bind - - -	3	8		
Grey and blue stone - - - - -	1	6		
Bind and ironstone (Dark blue bind with brown ironstone)	5	0		
Coal (soft) - - -	3	4	981	5
Bind (dark blue) - -	3	6		
Coal (soft and tender)	2	9	987	8
Fireclay (Dunns or bat) -	3	0		
Coal (tender) - - - -		10	991	6
*Dark blue bind and clunch with ironstone 2 in.	15	4		
Light brown ironstone -		2		
Dark blue bind - -	17	9		
Brown ironstone balls - -		4		
Dark blue bind with streaks of greystone-	11	3		
Tender blue and grey bind and dunns	1	1		
Coal with a seam of pyrites. Like the Seven Feet Coal but burns to white ashes -	5	6	1042	11
Dark grey tender dunns - - -	2	0		
Coal, Very tender and friable. Full of bright batty slips	11	6	1056	5
Very soft and tender dunns	4	0		
Black curly ironstone balls		3		
Very tender black shale or dunns	4	0		
Very curly black ironstone balls -		5		
Very tender bright black shale with ironstone balls, from 1 in. to 6 in.	3	0		
Bright black shale with very tender ironstone - - -	3	2		
Rather stronger black shale to dark blue tender bind - - -	5	6		
Slate coloured ironstone with white spar		6		
Blue bind, bored into	10	6	1101	7

* The section below this is from the sinker's account.

Baddesley Colliery, Baxterley.

SPEEDWELL PIT.

From Rev. W. H. Coleman's MSS.

——	Thickness.		Depth.	
	Ft.	In.	Ft.	In.
Rise of bank	12	0		
Soil and clay	7	2		
Grey ramelly stone	12	0		
Sand rock	8	0		
Brown sand rock	40	8		
Hard stone, Boulders	13	8		
Blue bind	4	6		
Grey cank	5	11		
Sandstone	2	9		
Clunchy bind	7	10		
Sandstone	3	0		
Stony bind	4	0		
Clunch bind	4	3		
Strong clunchy bind	3	3		
Stone and cank	1	6		
Stone and strong bind	9	0		
Stone and cank	6	0		
Clunchy bind	8	0		
Clunchy grey stone	10	0		
Light blue bind	3	0		
Stony bind	6	0		
Stone and cank boulders	8	0		
Stony clunch	6	0		
Hard stone and cank	16	0		
Stony bind	4	0		
Hard stone	2	0		
Hard stone and cank	4	0		
Stone and cank	3	3		
Grey clunch	3	0		
Tender clunch	10	6		
Stronger clunch	4	0		
Clunchy bind	2	0		
Stony bind	2	0		
Good stony bind	2	4		
Stony bind	3	0		
Hard stone and cank	2	6		
Bat and clunch	4	0		
Stronger [clunch]	2	9		
Bat	1	0		
Clunch or fireclay	2	0		
Blue bind	3	0		
Hard stone and cank	3	8		
Stony bind	3	5		
" "	4	0		
Hard stone		9		
Stone bind	1	0		
Sharp hard stone	1	0		
Cank	1	0		
Close stone	2	0		
Stony bind	2	6		
Porous sandstone	6	6		
Coarse stone	3	0		
" "	1	6		

——	Thickness.		Depth.	
	Ft.	In.	Ft.	In.
Clunch or fireclay	4	0		
Clunch bind	4	3		
Sharp gritstone	3	6		
Cank	1	0		
Stone with sharp hard boulders	3	0		
Coarse stone	5	0		
Sloom		6		
Clunch and coal sheds	3	9		
Clunch or fireclay	2	9		
Bat or rattlejack		6		
Grey clunch		9		
Fireclay	1	0		
Clunch or fireclay	3	9		
Tender bat		6		
Coal, batty		6	322	11
Tender bat		3		
Tender clunch	5	0		
Fireclay	2	6		
Clunch or fireclay	5	6		
Hard stone		6		
Batty clunch	5	0		
Bind or shale	1	0		
Ironstone balls		3		
Bind or shale	1	0		
Coal, tender		2	344	1
Shaly bind	2	4		
Broad bind	3	6		
Clunchy bind and bat	1	0		
Hard clunch	2	4		
Hard stone	10	0		
Close hard stone	6	0		
Batty bind with pebbles	3	6		
Close hard stone	10	0		
Tender bat	1	0		
Bind, ironstone balls	1	6		
Strong bind	2	0		
Hard stone		6		
Stony bind	2	6		
Hard stone		6		
Stony bind	3	0		
Hard close stone	1	3		
Strong broad bind	2	0		
Kind broad bind	3	0		
Ironstone		1½		
Strong bind	2	0		
Ironstone		1½		
Kind bind	3	0		
Ironstone		1½		
Kind blue bind	3	0		
Blue bind	2	0		
Ironstone		2		
Tender bind	1	8		
Ironstone		2		
Blue bind	1	0		
Tender bat	1	0		
Coal, soft	3	6	417	10½
Bat	2	6		
Hard stone	1	0		

——	Thickness.		Depth.	
	Ft.	In.	Ft.	In.
Bind	6	0		
Stone		4		
Kind bind	3	8		
Lighter bind	1	0		
Kind bind	8	6		
Ironstone		1		
Bind	1	10		
Ironstone		0½		
Rattlejack	1	3		
Bind		2		
Coal	2	0	446	
Tender clunch	2	0		
Fireclay	4	8		
Clunchy bind	1	0		
Strong bind	1	0		
Kind bind	2	0		
Tender bind	2	0		
Ironstone		2		
Strong bind	3	10		
Strong light bind	7	0		
Strong bind	5	0		
Very strong bind	2	0		
Strong bind	1	0		
Close hard stone		9		
Strong bind	2	0		
Broad bind		10		
Bat or bind	1	3		
Coal, Rider Coal	5	4	488	1
Bat		6		
Coal, Bare Coal	3	7	492	
Tender clunch		6		
Strong clunch	1	6		
Hard stone	4	6		
Stony bind	1	0		
Ironstone		5		
Bind		7		
Hard stone	5	0		
Strong bind	1	8		
Stony bind	3	0		
Stone	5	3		
Tender bind	1	4		
Coal, Ell Coal	1	9	518	8
Sloam		6		
Coal		3	519	5
Clunch	3	0		
Stone	4	6		
Bind	2	0		
Strong bind	3	0		
Fireclay	6	0		
Clunchy bind	1	0		
Strong bind		11		
Cherty bind	6	0		
Ironstone		4		
Bind	2	8		
Ironstone		5		
Stone	1	7		
Strong bind	5	0		
Stone		10		
Hard bind	7	0		
Stony bind	3	0		

——	Thickness.		Depth.	
	Ft.	In.	Ft.	In.
Strong bind	2	0		
Strong bind	4	0		
Hard stone	4	3		
Hard cank	7	9		
Flinty stone	8	3		
Strong bind	2	0		
Sharp bind	5	6		
Stone bind	5	0		
Ironstone		2½		
Hard stone bind	7	3		
Stone bind	10	7½		
Coal		9	624	3
Stone	2	9		
Clunchy stone	3	0		
Stone	1	0		
Kind bind	7	11		
Coal, STONE COAL	2	6	646	5
Clunchy stone	9	6		
Stony bind	3	0		
Hard stone		6		
Bind with sheds		1½		
Stone	1	5		
Cank	3	5		
Kind bind	1	6		
Bind	5	0		
Ironstone		1		
Bind	4	0		
Ironstone		2		
Bind	3	11		
Shale	1	2		
Ironstone		2		
Bind	2	6		
Ironstone		1½		
Bind	5	8		
Ironstone		1½		
Bind	3	7		
Strong bind	1	0		
Coal	1	6	694	10½
Bat	1	0		
Coal, SEVEN-FEET COAL	6	0	701	10½
Clunch	1	6		
Bat	1	3		
Tender bat	1	5		
Duns	1	0		
Coal, TRENCHER COAL		9	707	9½
Duns or bat	2	6		
Shale	1	0		
Bind	2	6		
Clunchy stone	1	0		
Bind	5	0		
Stony bind	3	0		
Bat	1	0		
Coal	2	0	725	9½
Duns	2	0		
Stone	1	5		
Bat	4	0		
Clunchy bind	2	4		
Clunch	7	6		
Clunchy bind; ironstone	1	0		
Cank	8	0		
Stone	3	0	755	0½

Merevale.

From Rev. W. H. Coleman's MSS.

——	Thickness.		Depth.	
	Ft.	In.	Ft.	In.
Stony ratchet	14	0		
Coal, smut	3	0	17	0
Clunch	2	0		
Stone		9		
Bind -	26	0		
Ironstone		7		
Coal -	2	5	48	9
Clunch	9	9		
Bind - -	18	3		
Coal, SEVEN-FEET COAL	5	0	81	9
Clunch -	2	7		
Bind -	5	4		
Coal -		4	90	0
Clunch -	7	0		
Stony bind	6	0		
White stone -	2	0		
Bind - - -	3	0		
Coal - -		4	108	4
Clunch -	7	0		
Bind and ironstone -	50	0		
Coal - -	2	0	167	4
Clunch and ironstone -	6	0		
Bind -	13	10		
Coal - - - -	4	8	191	10
Clunch and ironstone - - -	15	6		
Bind and ironstone - - - -	24	0		
Bind - - - -	5	6		
Duns - - -	2	0		
Coal, BENCH COAL -	6	2	245	0

Merevale.

PIT NEAR MOUTH OF THE HIGHER TUNNEL.

From Rev. W. H. Coleman's MSS.

——	Thickness.		Depth.	
	Ft.	In.	Ft.	In.
Clay	24	0		
Coal	1	0	25	0
Sloom		6		
Coal		9	26	3
Sloom		6		
Coal		6	27	3
Clunch	15	8		
Sandstone -	2	0		
Black bird	4	3		
Sandstone -	26	6		
Black bind -	4	0		
Clunch	4	0		
Sandstone -	3	4		
Coal		6	87	6
Sloom	1	0		

——	Thickness.		Depth.	
	Ft.	In.	Ft.	In.
Coal -		10	89	4
Clunch -	3	0		
„ and ironstone-	2	0		
White sandstone -	6	0		
Stone bind- -	2	0		
Stone "Four-Foot" - -	13	7		
Bind -	15	9		
Ironstone		3		
Coal, FOUR-FEET COAL - - -	3	10	135	9

Merevale Common.

BORING BELOW THE BENCH COAL.

From Rev. W. H. Coleman's MSS.

——	Thickness.		Depth from Surface.	
	Ft.	in.	Ft.	in.
Clunch	2	0		
Coal smut - -	12	0	14	0
Clunch -	7	6		
Bind -	9	0		
Ironstone -	1	0		
Bind - -	5	0		
Clunch -	5	0		
Cank - -	2	8		
Blue bind -	6	0		
Ironstone - - -	1	0		
Bind - - -	13	0	64	2

Birch Coppice Colliery, Hall End, Polesworth

From Mr. G. Fowler.

——	Thickness.		Depth.	
	Ft.	in.	Ft.	in.
Rise of ground	6	0		
Soil - - -		10		
Sand mixed with sandstone	6	8		
Dark brashy rock	2	1		
Brown rock	3	11		
Blue clay	2	0		
Very hard grey rock - -	4	0		
Brown brashy rock (water 20 galls. a min.)	2	6	28	0
Blue [clay], mild	4	6		
Blue clay, very strong and gritty	13	6		
Grey rock -	37	6		
Cank and pebbles	4	0		
Grey rock, very strong -	9	0		
Cank, pebbles and limestone (Water 200 galls. a min.) - -	6	6	103	0
Strong dark clay, with rock -	8	0		
Blue and red clay with balls of ironstone	4	7		
Grey sandstone - -	60	0		

——	Thickness.		Depth.	
	Ft.	In.	Ft.	In.
Cank, pebbles and limestone	15	1	190	8
Strong rocky bind	11	11		
Very strong grey rock	15	6		
Red marl and fireclay, good	5	0		
Rocky bind	7	0		
Very strong grey rock, red in joints	3	6		
Very strong dark grey rock	16	6		
Strong dark rocky bind	10	4		
Red marl, good	15	0		
Light blue marl, strong	4	8		
Light clunchy fireclay	3	3		
Rocky bind	2	6		
Light clunchy fireclay	16	1		
Dark bind	2	2		
Coal, No. 1		3	304	4
Dark fireclay		3		
Red marl, good	6	0		
Light fireclay	6	7		
Strong light rock	11	0		
Fireclay	2	6		
Blue rock	12	6		
Light blue rock, very strong	41	5		
Rocky bind	7	0		
Grey rock	6	1		
Rocky bind	3	0		
Grey rock	2	6		
Very rough light rock, mixed	6	0		
Strong grey rock	9	3		
Red fireclay	2	3		
Blue rock	20	5		
Coal, No. 2	2	2½	443	3½
Black bat	3	0½		
Rocky bind	9	2		
Black bat		3		
Coal, No. 3	1	2	456	11
Dark prickings		2		
Strong rocky bird	13	6		
Rock, cank and bind mixed, very strong	12	0		
Grey rock	3	0		
Dark bind, very greasy	14	6		
Coal, No. 4		6	500	7
Dark bat		6		
Fireclay	1	0		
Light fireclay	3	8		
Black bat		4		
Dark brown rock, very strong	10	8		
Coal, THE FOUR-FEET COAL	4	4	521	1
Dark prickings		4		
Dark clunchy fireclay	5	0		
Grey rock, very strong	21	0		
Black bat		3		
Blue bind, very strong	4	6		
Dark bind	7	6		
Light ironstone		2		
Blue bind	3	0		
Ironstone		1		
Dark smutty bat		3		
Coal, soft dicey coal	4	4	567	6

——	Thickness.		Depth.	
	Ft.	In.	Ft.	In.
Soft dark bind	2	9		
Brown rock	2	6		
Dark bind -	13	7		
Brown ironstone		2		
Dark bind -	7	5		
Dark shale and rattlejack -	2	4		
Coal, THIN RIDER COAL	2	9	599	0
Dark prickings - -		7		
Very strong light clunch mixed with ironstone balls	7	6		
Rocky bind, dark -	15	5		
Light stone - -		6		
Rocky bind, dark blue -	1	6		
Dark slume - -	1	0		
Coal, RIDER COAL -	4	4	629	10
Pricking -		5		
Coal, BARE COAL	2	10	633	1
Black bat - -		2		
Light clunchy fireclay -	6	2		
Strong dark bind -	3	10		
Coal and dark clunch mixed	7	0	650	3
Blue clunchy bind -	3	0		
Brown rock, very strong, mixed with ironstone balls -	14	6		
Rocky bind -	5	6		
Blue bind - -		3		
Coal, inferior	2	0	675	6
Blue bind -		6		
Strong white rock - -	3	6		
Blue bind, mixed with ironstone balls	2	5½		
Black shale	1	6		
Rocky bind, mixed with ironstone balls	3	10		
Blue flaky bind -	7	2		
Coal, good - - -	1	4	695	9
Grey rocky bind with streaks	9	3		
Blue bind - -	1	6		
Coal and black bat	4	3	710	9
Dark pricking -		4		
Light clunchy bind, very strong, with balls of ironstone -	10	2		
Black bat mixed with grey bat	4	6		
Dark clunch with ironstone balls	2	0		
Light flint rock	5	4		
Blue bind - - -		4		
Strong rocky bind mixed with stone-	11	4		
Blue bind	3	0		
Black bat - - -	1	0		
Coal, SMITHY COAL - -	2	3	751	0½
Dark clunch -	1	4		
Strong rocky clunch with balls of white stone -	3	2		
Dark clunch mixed with ironstone balls	11	3		
Dark pricking -		3		
Coal - -	2	0	769	0½
Black shale	2	9		
Dark pricking		9		
Coal -		4	772	10½
Clunch -		5		

——	Thickness.		Depth.	
	Ft.	In.	Ft.	In.
Black bat		4		
Clunch	1	4		
Strong white rock	5	7		
Rocky bind with flakes of ironstone	4	0		
Ironstone, not regular		2		
Grey rock, very strong	2	7		
Blue bind	2	11		
Ironstone, not regular		2		
Blue bind	1	10		
Ironstone bed		2½		
Blue bind	1	7½		
Ironstone bed		2		
Blue bind	2	5		
Soft clunchy bind		2		
Ironstone bed		5½		
Dark bind	3	0		
Dark pricking		2		
Dark bind with flakes of ironstone	8	11½		
Coal	2	3	811	7½
Soft bind	2	6		
Coal, Seven-feet Coal	6	0	820	1½
Pricking		3		
Clunchy bind with ironstone balls	1	0		
Strong clunchy bind	4	1		
Clunchy bind with ironstone balls	5	3	830	8½

Birch Coppice Colliery, Polesworth.

Old Shaft. No. 1 of Ordnance Map.

From Mr. G. Fowler.

——	Thickness.		Depth.	
	Ft.	In.	Ft.	In.
Brown sandstone				
Blue marl				
White sandstone				
White rag stone				
Brown sandstone				
Brown sandstone, with gravel				
Fireclay				
Bind				
Grey rock				
Coal		3	322	2
Grey rock				
Blue bind				
Grey rock				
Coal		4	389	1
		8	391	11
Coal		9	415	3
Coal		5	446	4
Black ball, coal and grey rock				
Coal, Four-feet Coal	2	0	479	5
Grey rock				
Bind and ironstone				

——	Thickness.		Depth.	
	Ft.	In.	Ft.	In.
Coal	2	3	522	8
	1	6	524	2
	2	0	526	2
Dark bind				
Coal, Thin Rider Coal	3	6	558	5
Blue bind				
Coal, Rider Coal	2	6	601	5
Brown skerry rock				
Coal	1	0	628	11
Clunch and ironstone				
Coal		3	649	8
Blue bind				
Coal	1	4	671	3
Coal, Smithy Coal	2	3	735	0
Coal	1	9	753	3
Blue bind and ironstone				
Blue bind				
Coal, The Thin Coal	2	3		
Coal, Seven-feet Coal	6	0	800	1

Pooley Hall Colliery, Polesworth.

From Mr. W. Hill.

——	Thickness.		Depth.	
	Ft.	In.	Ft.	In.
Raised top and soil	4	0		
Clay, chiefly yellow and strong	2	6		
Blue marl	4	0		
Blue marl	7	6		
Sand and loam	2	6		
Post	1	6		
Coal (soft)	4	6	26	6
Dark seggar	1	3		
Dark seggar	1	0		
Post	3	6		
Blue clunch	11	6		
Bastard seggar	7	10		
Post (water 300 to 400 galls. per min.)	1	0		
Post, very jointy	22	0		
Coal	1	6	76	1
Bastard seggar	3	0		
Seggar	1	0		
White post	8	0		
Kind bind	2	4		
Bastard bind	10	0		
Bind with layers of post	7	8		
Dark fireclay	5	0		
Coal		6	113	7
Dark fireclay	2	0		
Dark fireclay mixed with layers of bind and ironstone balls	6	0		
Kind flaky binds	4	6		
Kind blue binds	40	3		

——	Thickness.		Depth.	
	Ft.	In.	Ft.	In.
Coal, in the southern half of the shaft, but running out to a thread on the other side	4	0	170	4
Black shale		2		
Bastard fireclay	2	3		
Fireclay mixed	1	4		
Coal	3	2	177	3
Fireclay	1	0		
Blue ground with ironst. balls (some water)	4	6		
Bind	2	0		
Light sandstone	7	0		
Rock bind	3	0		
Rock bind	4	9		
Black parting		2		
Coal		9	200	5
Black parting		6		
Coal	1	0	201	11
Bat		5		
Dark fireclay	3	0		
Black shale		1		
Bastard fireclay with ironstone balls	5	2		
Light binds	19	0		
Coal and bat mixed	1	6	231	1
Fireclay with ironstone balls	4	4		
Coal, coarse and hard	2	8	238	1
Fireclay		6		
Coal		6	239	1
Fireclay, good	1	6		
Bastard fireclay	1	6		
Light rock binds	1	5		
Grey sandstone	3	0		
Light blue bind	1	0		
Grey sandstone	10	0		
Kind blue bind	3	0		
Mixed grey and white sandstone	5	0		
Kind bind	2	0		
Coal	1	6	269	0
Strong patch	1	0		
White fireclay		9		
Coal		9	271	6
White fireclay with ironstone balls	5	9		
Bastard fireclay with ironstone balls	4	6		
Bastard rock		9		
Bastard fireclay	2	9		
Black rock	3	0		
Kind binds	10	6		
Bat		6		
Coal	1	6	300	9
Bastard fireclay	5	0		
Sandstone		6		
Binds with layers of stone	6	0		
Black ground	4	0		
Coal	3	6	319	9
Fireclay	3	8		
Smut and coal		6		
Fireclay with ironstone	2	6		
Blue bind with layers of stone	9	0		
Coal		2		
Grey sandstone, hard	18	10		

——	Thickness.		Depth.	
	Ft.	In.	Ft.	In.
Coal	2	2	356	7
Dark pricking		4		
Bastard fireclay ironstone balls	3	0		
Grey post	2	3		
Bind		6		
Dark grey post	1	3		
Dark bind with layers of stone and ironstone balls	13	6		
Coal, inferior burning	2	3	379	8
Black ground	1	0		
Dark fireclay	5	6		
Dark rock with layers of stone	5	3		
Grey peldon	6	9		
Blue rock bind with stone	1	9		
Blue bind with bands of stone	11	6		
Rock	1	0		
Dark bind	8	6		
Dark bind	9	10		
Dark bind with little stone	6	7		
Coal	2	9	440	1
Fireclay		9		
Gob. SEVEN-FEET COAL	3	6	444	4
Light fireclay	1	6		
Coal. TRENCHER COAL		6	446	4
Fireclay	3	6		
Strong brown fireclay	1	6		
Strong rock bind with stone balls	25	10		
Dark ground with stone balls	1	8		
Rock bind with stone balls	19	6		
Bat		3		
Coal, bright		9		
Coal, hard	1	3	500	7
Dark fireclay	5	3		
Dark fireclay	2	0		
Dark broken clay	2	6		
Whin	4	0		
Rock bind	2	0		
Grey post	2	6		
Grey post	5	0		
Rock bind with stone balls	6	6		
Black shale	2	9		
Coal	3	6	536	7
Dark fireclay	3	4		
Coal		9	540	8
Dark fireclay	3	10		
Blue rock bind with stone balls	17	10		
Coal	2	5	564	9
Dark fireclay	3	6		
Coal, DOUBLE COAL	4	8	572	11
Light fireclay	6	6		
Grey post	4	4		
Blue bind	1	2		
Light rough rock	3	2		
Blue rock bind	3	6		
Grey peldon	2	6		
Blue rock bind	5	6		
Blue rock bind	1	6		
Grey peldon	2	0		
Bind parting		2		

——	Thickness.		Depth.	
	Ft.	In.	Ft.	In.
Grey peldon	2	0		
Light rock	1	0		
Blue bind with layers of stone	5	0		
Fireclay		2		
Black shale		6		
Coal	4	10	616	9
Dark fireclay	2	1		
Black ground		6		
Ring of coal		4		
Dark fireclay	1	0		
Black bat	2	0		
Dark bind with layers of stone	5	8		
Coal, Bench Coal	4	6	632	10
Dark fireclay	7	0		
Black ground	2	6		
Black ground	6	6		
Fireclay rock	5	0		
Strong blue bind with balls of stone	10	6		
Blue bind jointy with balls of stone	8	0		
Black bind with balls of stone	2	7		
Black bat	3	4		
Coal	1	6	679	
Dark fireclay	1	6		
Peldon				

Polesworth Colliery.

From a paper by the Rev. James Yates in the Geol. Trans., 2nd Series, vol. ii., p. 261. The section was furnished by Dr. Power, of Lichfield.

——	Thickness.		Depth.	
	Ft.	In.	Ft.	In.
Soil and clay	37	6		
Brown rocky clunch	12	0		
Smut		6		
Fireclay	5	6		
Pimply	4	0		
Bind	9	0		
Bind ; ironstone	4	0		
Blue bind	4	0		
Coal, Ell or Four-feet Coal	4	6	81	0
Fireclay	3	0		
Blue bind	14	0		
Rock	25	0		
Coal, Upper Sough Coal	2	6	125	6
Clay and clunch	4	0		
Rock	3	0		
Coal		3	132	9
Fireclay	2	0		
Bind	5	9		
Black clod		8		
Ironstone bind	11	8		
Coal and clot. Half-yard Coal	2	0	154	10
Fireclay	2	3		
Rock	3	4		
Ironstone bind	11	8		
Coal, Slate Coal	7	3	179	4

——	Thickness.		Depth.	
	Ft.	In.	Ft.	In.
Fireclay and pimply - -	7	0		
Scurry - -	12	3		
Bind and slums - -	7	6		
Coal, Smithy Coal	2	4	208	5
Pimply -	14	0		
Black clod with ironstone -	3	2		
Coal, Stone Coal	3	0	228	7
Fireclay -	1	2		
Mainstone -	3	0		
Blue bind	9	0		
Ironstone -		10		
Blue bind	2	6		
Ragstone		8		
Blue bind -	3	0		
Coal, Thin Coal -	1	8	250	5
Soft fireclay	9	0		
Strong bind	21	0		
Coal, Main or Seven-feet Coal	6	0	286	5

Polesworth Colliery.

Messrs. Shaw and Co.'s Pit near the Railway Station.
From Rev. W. H. Coleman's MSS.

——	Thickness.		Depth.	
	Ft.	In.	Ft.	In.
Soil - - -		9		
Gravel and sand	16	0		
Blue bind	1	6		
Coal smut -	2	0	20	3
Clunch	6	0		
Blue bind -	11	0		
Stony bind	7	6		
Strong blue stone	2	3		
Blue bind	10	6		
Coal	1	4	58	10
Stony clunch -	6	6		
Stony bind ; ironstone balls	9	6		
Clunch and bat ; ironstone balls	7	3		
Strong bind	6	6		
Soft bind	1	6		
Coal -		3	90	4
Strong bind	10	3		
Soft bind -	1	6		
Clunch and bat -	3	0		
Stony clunch	6	6		
Blue bind ; ironstone	12	10		
Coal. Smithy Coal	2	4	126	9
Clunch -	4	6		
White sandstone	3	6		
Stony bind -	7	3		
White stone	1	6		
Blue bind ; ironstone	21	6		
Ragstone -	2	6		
Soft blue bind	10	0		
Coal -	1	3	178	9
Dun-coloured clunch	5	0		
Dark-coloured clunch - -	6	0		
Coal. Main or Seven-Feet Coal -	6	0	195	9

Tamworth Colliery.
From MESSRS. LANGFORD AND RIDSDALE.

	Thickness.		Depth.	
	Ft.	In.	Ft.	In.
Surface clay	4	0		
Measures	6	0		
Coal	1	6	11	6
Fireclay	15	6		
Measures	21	6		
Sandstone (water)	5	6		
Measures	27	6		
White rock (water)	10	0		
Measures	108	0		
Coal	2	8	202	2
Fireclay or clod	9	0		
Coal	3	10	215	0
Measures	221	10		
Ironstone	3	2		
Coal, SMITHY COAL	3	0	443	0
Measures	26	2		
White ironstone	4	10		
Measures	26	9		
Coal	2	9	503	6
Parting		6		
Coal	6	0	510	0
Fireclay	6	0		
Measures	51	4		
Coal	2	8	570	0
Measures				
Coal	2	11		
Fireclay				
Measures				
Coal	1	11	600	0
Measures				
Coal. DEEP OR DOUBLE COAL	4	3	615	0
Measures				
Coal, BENCH COAL	5	0	654	0

Glascote Colliery.*
From Rev. W. H. Coleman's MSS.

	Thickness.		Depth.	
	Ft.	In.	Ft.	In.
Ground	20	0		
Yellow clay	7	6		
Coal	1	8	29	2
Fireclay	1	2		
White pipeclay	2	6		
Blue bind	11	0		
Coal		6	44	4
Fireclay	4	1		
Red fireclay	7	3		
Blue bind	1	8		
Sandstone	16	0		
Bind and fireclay	9	3		
Sharp stone	1	2		
Blue bind	19	6		
Coal	2	1	105	4

* Mr. Grayston has furnished us with the details of the shaft at Amington belonging to this Company, but has requested us to withhold its publication for the present.

——	Thickness.		Depth.	
	Ft.	In.	Ft.	In.
Black fireclay	2	6		
Black fireclay	4	0		
Black fireclay	3	6		
Blue bind	49	6		
Coal. Ell or Four-Feet Coal	3	6	168	4
Blue bind	32	0		
Coal		6	200	10
Fireclay	1	0		
Sandstone	9	0		
Clunchy bind	18	0		
Coal, soft	1	9	230	7
Fireclay	2	0		
Bind and ironstone	21	0		
Fireclay	1	6		
Coal	2	3	257	4
Grey rocky bind	12	0		
Blue bind	6	0		
Coal, Half-Yard Coal	2	0	277	4
Fireclay		6		
Blue bind	21	9		
Coal, Slate Coal	2	0	301	7
Fireclay	4	6		
Coal (Bat)	4	0	310	1
Blue bind	10	8		
Sandstone (skerry)	18	0		
Blue bind (ironstone)	21	0		
Bind	2	0		
Coal, Stone Coal	1	3	363	0
Fireclay		9		
Mainstone rock	12	0		
Blue bind (ragstone)	34	0		
Blue bind	20	6		
Coal, Thin Coal	2	3	432	6
Duns	2	0		
Coal, Seven-Feet Coal	6	0	440	6
Fireclay	6	0		
Clunch	18	0		
Coal	2	3	466	
Grey rocky bind	6	0		
Sharp stone	3	0		
Stony bind	14	6		
Black bat	1	6		
Coal	2	0	493	9
Sharp rock	3	0		
Blue clunch		11		
Coal		6	498	2
Fireclay	3	5		
Rock	31	8		
Rocky bind	4	6		
Black bat (ironstone)	3	0		
Coal	4	0	544	9
Fireclay	2	6		
Bat	2	4		
Coal	2	0	551	7
Clay		8		
Coal, Bench Coal	5	4	557	7
Blue bind	28	6		
Coal	9	0	595	1
Clunchy bind	19	6	614	7

Lindley Hall.

Boring No. 1.

By Mr. Hemming.

From Rev. W. H. Coleman's MSS.

		Thickness.		Depth.	
		Ft.	In.	Ft.	In.
	Soil	7	0		
	Red clay and marl	4	6		
	Mottled ground	2	6		
	Blue skerry	1	0		
	Rock marl	99	0		
	Blue skerry		6		
	Blue bind		6		
	Hard blue rock		6		
	Rock marl and gypsum	41	6		
10	Hard blue rock	1	0	158	0
	Rock marl and blue skerry	6	0		
	Rock marl	14	0		
	Hard blue rock	9	0		
	Strong mottled ground	9	0		
	Rock marl and blue skerry	42	0		
	Rock marl and gyspum	24	6		
	Hard blue rock	2	6		
	Mingled ground	9	0		
	Red marl	17	6		
20	Gypsum. Marl partings	3	0	294	6
	Red mottled rock	2	6		
	Rock marl	3	6		
	White gypsum		6		
	Mingled ground	6	0		
	Red clunch	1	0		
	Rock marl	6	6		
	Red clunch	2	0		
	Mingled ground	8	0		
	Blue clunch	0	6		
30	Hard mottled rock	7	6	332	6
	Hard stone or peldon		6		
	Blue and mottled ground	7	6		
	Rock marl	2	6		
	Hard blue rock	2	6		
	Blue and mottled ground	9	6		
	Rock marl	14	6		
	Hard blue rock		6		
	Mottled ground	5	6		
	Hard blue rock	4	0		
40	Blue and mottled ground	3	0	382	6
	Rock marl	12	0		
	Grey rock and peldon	4	0		
	Dark red rock	2	0		
	Blue rock and bind	1	6		
	Blue and mottled rock	19	6		
	Blue rock and bind	10	6		
	Rock marl and gypsum	1	6		
	Blue bind and clunch	9	0		
	Red and mottled ground	17	6		
50	Blue bind and clunch	3	0	463	0

		Thickness.		Depth.	
		Ft.	In.	Ft.	In.
	Rock marl and gypsum	7	6		
	Strong mottled ground	8	6		
	Brown rock with marl	10	0		
	Rock marl - -	1	6		
	Blue and mottled rock	6	0		
	Blue rock	3	0		
	Mottled clunch	2	0		
	Brown sandstone	6	0		
	Blue rock and smut	6	6		
60	Mottled rock	8	0	522	0
	Blue rock, with partings	3	0		
	Blue clunch	0	6		
	Light rock -	1	0		
	Mottled rock	5	6		
	Light peldon -	1	6		
	Red and mottled rock	19	0		
	Blue bind -	1	6		
	Red and mottled rock	10	6		
	Hard blue bind	2	0		
70	Close red sandstone	18	0	584	6
	Mottled rock -	13	6		
	Blue rock and bind	1	6		
	Mottled partings -	1	9		
	Light peldon -		6		
	Red and blue rock	14	3		
	Blue bind	1	6		
	Red sandy rock -	3	6		
	Strong light blue bind	4	6		
	Peldon, with smut - -	2	6		
80	Brown rock - - - - -	1	0	629	0
	Rock marl - - -	3	0		
	Hard brown rock - -	4	0		
	Rock marl and sandstone alternating -	24	6	660	6

Lindley Hall.

Boring No. 2.

From Rev. W. H. Coleman's MSS.

		Thickness.		Depth.	
		Ft.	In.	Ft.	In.
	Soil and clay -	4	0		
	Rock marl and skerry -	14	0		
	Sandstone -	1	6		
	Blue skerry		6		
	Rock marl -	16	6		
	Blue marl	1	6		
	Rock and marl	21	0		
	Hard grisly rock -	2	0		
	Red sandy marl -	33	6		
10	Rock marl and gypsum	7	0	101	6
	Hard grisly rock -	1	0		
	Strong marl	5	0		
	Blue rock or skerry	2	0		

	——	Thickness. Ft.	In.	Depth. Ft.	In.
	White gypsum -	1	6		
	Red sandstone	1	0		
	Rock marl and gypsum	32	6		
	Hard brown grisly rock	4	0		
	Gypseous marl and skerry -	9	8		
	Blue mottled clunch	1	0		
20	Rock marl with gypsum	22	0	181	2
	Hard variegated rock -	7	0		
	Gypseous marl and sandstone	20	4		
	Blue mottled rock	1	6		
	Rock marl and sandstone - -	12	0	222	0

Lindley.

Boring in a Field called Barn Close, between Chads Lane and Watling Street, near Lindley.

From Rev. W. H. Coleman's MSS.

	——	Thickness. Ft.	In.	Depth. Ft.	In.
	Soil -	2	0		
	Gravel -		6		
	Blue marl and skerry - -	3	6		
	Red marl	2	6		
	Blue sandy marl -	3	0		
	Red rock and marl -	8	0		
	Blue marl -	1	0		
	Strong red marl -	7	9		
	Blue sandy marl	4	6		
10	Red marl	9	0	41	9
	Blue marl -	1	0		
	Strong red marl	8	3		
	Variegated rock -	29	0		
	Sandy rock	2	0		
	Rock marl -	4	6		
	Mottled rock -	2	6		
	Rock marl	16	6		
	Mottled ground	2	0		
	Blue sandstone -	1	6		
20	Sandy rock marl	37	6	146	6
	Rock marl and gypsum	19	6		
	Dark mottled ground -	1	6		
	Rock marl and gypsum	51	6		
	Blue and mottled rock	4	0		
	Rock marl and gypsum -	11	0		
	Red rock -	3	0		
	Brown peldon -	1	3		
	Red rock and marl with gypsum	28	0		
	Brown and grisly rock		9		
30	Marl - - -		9	267	9
	Dark shaly lines	1	0		
	Rock marl and gypsum - -	15	6	284	3

Lindley.

BORING ON THE OLD POND SIDE OF LINDLEY WOOD.

		Thickness.		Depth from Surface.	
		Ft.	in.	Ft.	in.
	Soil and clay	3	0		
	Sandy clay	1	6		
	Marl and sandstone	4	0		
	Blue sandstone	4	6		
	Red sandstone and marl	14	0		
	Blue rock	7	0		
	Brown rock	4	0		
	Red sandstone and marl	11	0		
	Mottled rock	5	0		
10	Red sandstone and marl	5	0	59	0
	Sandstone	1	6		
	Red sandstone	8	0		
	Mottled clunch	3	6		
	Red sandstone and marl	7	6		
	Blue rock	1	6		
	Sandy marl	3	6		
	Mottled rock	1	6		
	Blue and red sandstone and marl	20	0		
	Mottled rock	5	0		
20	Marl	4	0	115	0
	Red sandstone	3	0		
	Marl and sandstone	36	0		
	Blue and mottled rock	9	0		
	Marl and sandstone with gypsum	39	0		
	Blue rock	4	0		
	Gypseous rock	18	0		
	Mottled rock	6	6		
	Blue rock	4	0		
	Brown rock	12	0		
30	Gypseous marl and sandstone	12	6	259	0
	Blue rock	3	0		
	Rock marl and gypsum	20	6		
	Rock and peldon	1	6		
	Marl and gypsum	5	0		
	Blue and mottled rock	7	6		
	Rock marl	2	0		
	Blue and mottled rock	4	6		
	Brown rock	19	6		
	Blue rock and smut	2	0		
40	Mottled ground	9	0	333	6

APPENDIX II.

LIST OF WORKS ON THE GEOLOGY OF LEICESTERSHIRE,

INCLUDING A FEW REFERRING TO THE IMMEDIATE NEIGHBOURHOOD.

By C. Fox-Strangways, aided by W. Whitaker, F.R.S.

LIST OF AUTHORS.

The figures refer to the dates of publication, those in brackets indicating the Maps and Sections of the Geological Survey.

A.

Adams, A. Leith, 1877–1881, 1879.
——— W., 1877.
Allport, S., 1870, 1874, 1879.
Allsop, C., 1842.
Ansted, Prof. D. T., 1863, 1866.
Atkins, A. F., 1883.
Aveline, W. T., (1859), 1860, 1877.

B.

Bakewell, R., 1812, 1819.
Bates, E. F., 1886.
Bauerman, H., 1858.
Beasley, H. C., 1890, 1892.
Bemrose, H. H. Arnold, 1896.
Bennett, Dr. F. W., 1899.
Berry, E. E., 1882.
Binns, J. G., 1897.
Blake, C. C., 1862.
———, J. F., 1891–1894, 1892.
Bonney, Rev. T. G., 1876, 1877, 1878, 1879, 1880, 1885, 1887, 1890, 1891, 1892, 1893, 1894, 1895, 1900.
Bragge, G. S., 1886.
Bristow, H. W., 1858.
Britton, J., 1807.
Brodie, Rev. P. B., 1857, 1867, 1874, 1875, 1876, 1881, 1884.
Brown, E., 1862.
———, H. T., 1887, 1889.
Browne, A. J. Jukes, 1885, 1888, 1890.
———, M., 1888, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897.
Buckland, Rev. Prof. W., 1823.
Burton, W., 1622.

C.

Callaway, C., 1881, 1889, 1895.
Carr, J. W., 1896.
Clifford, J., 1880.
Coke, G. E., 1896.
Coleman, Rev. W. H., 1846, 1863.

L.

Lapworth, C., 1882, 1886, 1887, 1888, 1896, 1898.
Lewis, G., 1868.
———, H. Carvill, 1894.
Lucy, W. C., 1870.
Lydekker, R., 1888–1890.

M.

M'Coy, F., 1049.
Mackie, S. J., 1862.
Mackintosh, D., 1865, 1880.
Mammatt, E., 1834.
Mann, E., 1874.
Marriott, J., 1884.
Marshall, T. G., 1859.
————, W., 1790.
Martin, R. F., 1885.
Maw, G., 1868.
Metcalfe, A. T., 1894.
Mills, M. H., 1891.
Molyneux, W., 1869, 1878.
Monk, J., 1794.
Moore, C. A., 1884.
Morris, J., 1843.
Moscrop, W. J., 1866.
Mott, F. T., 1868, 1878, 1885.
Murchison, Sir R. I., 1867.
Musgrave, R. M., 1870.

N.

Nichols, J., 1795–1815.

O.

Owen, Prof. R., 1865.

P.

Parkinson, R., 1813.
Paul, J. D., 1882, 1883, 1884, 1885, 1887, 1891, 1893, 1895, 1900.
Penning, W. H., (1879), (1887).
Phillips, W., 1822, 1823, 1824.
Pitt, W., 1807, 1813.
Plant, John, 1850, 1868.
———, James, 1856, 1858, 1859, 1861, 1862, 1863, 1865, 1869, 1874, 1875, 1877, 1879, 1882, 1884.
Powell, Prof. Baden, 1868.

Q.

Quilter, H. E., 1881, 1883, 1884, 1885, 1886, 1889, 1890.

R.

Ramsay, Sir A. C., 1858, 1864, 1871.
Randall, J., 1895.
Reade, T. Mellard, 1889, 1890.
Rücker, A.W., 1890, 1891.
Rutley, F., 1886.

S.

Sedgwick, Prof. A., 1834.
Sharman, G., 1886.
Sherborn, C. D., 1890, 1891.
Short, Dr. T., 1740, 1765.
Shrubsole, G. A., 1898.
Skertchly, S. B. J. (1872).
Smith, W., 1815, 1821.
Sorby, H. C. 1863.
Sowerby, J., 1812–1846.

STARTIN, A., 1866, 1869.
STOKES, A. H., 1878.
STOOKE, T. S., 1887.
STRAHAN, A. (1886), 1886.
STRANGWAYS, C. FOX-, 1897 (1899), 1899, 1900.

T.

TEALL, J. J. H., 1888.
THORPE, T. E., 1890, 1891.
TIMMINS, Rev., J. H., 1867.
TRIMMER, J., 1853.
TUCKER, W. T., 1896.
TUCKWELL, Rev. W., 1887.

U.

URE, Dr. A., 1834.

W.

WALLER, T. H., 1886, 1887.
WATTS, W. W., 1895, 1896, 1897, 1898, 1899 (1899), 1900.
WHITAKER, W., 1875–1889.
WILSON, E., 1877, 1882, 1884, 1885, 1887, 1889, 1892.
———, J. M., 1870.
WOODWARD, A. S., 1889, 1890, 1891.
————, C. J., 1881.
————, Dr. H., 1868, 1876, 1878, 1892.
————, H. B., 1874, 1893, 1894, 1895, 1897.
WRIGHT, J., 1885.

Y.

YATES, Rev. J., 1827.

MAPS AND SECTIONS OF THE GEOLOGICAL SURVEY.

Maps.—Scale 1in. to a Mile.

Quarter-sheet 53 N.E.—[Rugby] W. T. AVELINE and H. H. HOWELL. 1859.

Quarter-sheet 62 N.E.—[Tamworth] H. H. HOWELL. 1856.

Quarter sheet 63 N.W.—[Ashby-de-la-Zouch and Market Bosworth] H. H. HOWELL and E. HULL. 1855.

Quarter-sheet 63 N.E.—[Leicester] H. H. HOWELL. 1855.

Quarter-sheet 63 S.W.—[Hinckley] H. H. HOWELL. 1855. New edition by A. STRAHAN. 1886.

Quarter-sheet 63 S.E.—[Lutterworth and Market Harborough] W. T. AVELINE and H. H. HOWELL. 1859.

Sheet 64.—[Melton Mowbray to Market Harborough] J. W. JUDD, W. H. HOLLOWAY, and S. B. J. SKERTCHLY. 1872.

Sheet 70.—[Grantham] W. H. HOLLOWAY and others. 1886.

Quarter-sheet 71 S.W.—[Derby to Ashby-de-la-Zouch] E. HULL. 1855.

Quarter-sheet 71 S.E.—[Nottingham to Loughborough] E. HULL. 1855.

Sheet 155 New Series, *Solid and Drift.*—[Atherstone to Charnwood Forest] C. FOX-STRANGWAYS and W. W. WATTS. 1899.

Horizontal Sections.—Scale 6in. to a mile.

Sheet 46.—No. 1. Section from North-West to South-East, from the Trent near Repton to Bardon Hill, Leicestershire, crossing the New Red Sandstone, the Coleorton Coalfield by Whitwick and Swannington Collieries and the Millstone Grit and Carboniferous Limestone near Ticknall, by E. HULL. No. 2. From Nailstone Church, through Bagworth Colliery, south end of Charnwood Forest, Woodhouse Eaves, Buddon Wood, to the Lias Limestone quarries near Barrow-on-Soar. By H. H. HOWELL. 1858.

Sheet 48.—Section from Lazy Hill across the Permian and New Red

Sandstone to Glascote; the North end of the Warwickshire Coalfield, through Glascote Colliery, Hermitage Hill, and Polesworth to Grendon; from Grendon through Orton-on-the-Hill, Gopsall Park, Heather Mill, near Whitwick Colliery, North end of Charnwood Forest, Garendon Park, near Stanford Hall, to Wysall. By H. H. Howell. 1858.

Sheet 49.—No. 1. Section from Barr Beacon across the New Red Sandstone, Permian Strata, and Warwickshire Coalfield, through Sutton Park, Kingsbury, Hurley, Baxterley, and Merivale to Radcliffe Culey, near Atherstone. No. 2. From the New Red Sandstone, Bodymoor Heath, near Kingsbury, across the Warwickshire Coalfield through Cliff, Hockley, and Wilnecote to Shuttington, from Shuttington across the New Red Sandstone by No Man's Heath and Donisthorpe, the Leicestershire Coalfield, by Moira, the Carboniferous Limestone of Ticknall, to the Red Marl of Chellaston Hill, Derbyshire. By H. H. Howell. 1858.

Sheet 52.—No. 1 Section North and South from the Trent at Newton Solney to Swepstone, crossing the Ashby-de-la-Zouch Coalfield (Leicestershire) at Newall, Gresley, Moira, and Measham Hall. No. 2 Section from West to East, crossing the New Red Sandstone by Linton, the Coal Measures of Ashby Woulds and Coleorton Common, the Carboniferous Limestone of Grace Dieu and the Cambrian rocks of the North part of Charnwood Forest. By E. Hull. 1858.

Sheet 122.—Section from the Three Shire Stone, four miles N.W. of Kimbolton (Hunts), through Thrapston, Rockingham Forest (Northamptonshire), Uppingham (Rutland), and across Burrow Hill to the River Eye, west of Melton Mowbray (Leicestershire). By W. H. Holloway and W. H. Penning. 1879.

Sheet 124.—Section from Buddon Wood across Mount Sorrel, Burrow Hill (Leicestershire), The Vale of Catmos, through Oakham and Ketton (Rutland), to the Fenland at Peterborough (Northamptonshire). By W. H. Holloway and W. H. Penning. 1887.

Vertical Sections. Scale 40 feet to 1 inch.

Sheet 19.—Sections in the Leicestershire (Ashby-de-la-Zouch) Coalfield, Eastern or Coleorton District: Bagworth, Ibstock, Snibston No. 2, Snibston No. 1, Whitwick, Heather, Swannington, Peggs Green, Coleorton, Lount, Heath End, Rough Park Wood, and Woodville. By E. Hull. 1856.

Sheet 20.—Sections in the Leicestershire (Ashby-de-la-Zouch) Coalfield, Western or Moira District: Donisthorpe Old Colliery, Hastings and Grey Shaft and Rawdon Shaft Moira, Granville Colliery, Gresley Wood, Whitehouse, Oakthorpe, Woodfield, Swadlincote, Arthcote, New Stanton, and Gresley Common. By E. Hull. 1857.

LIST OF WORKS.

1622.

Burton, W.—The Description of Leicestershire; containing Matters of Antiquity, History, Armorye, and Genealogy. [P. 2, soils.] 4to. *London.* Ed. 2, 1777.

1740.

Short, Dr. T.—An essay towards a Natural, Experimental, and Medicinal History of the Principal Mineral Waters of.....Leicestershire.....particularly those of Neville Holt.....etc. 4to. *Sheffield.*

1748.

Hill, J.—A General Natural History [Gypsum at Mt. Sorrel, p. 114]. 3 vols. Folio. *London.*

1765.

Anon. [Dr. T. Short].—A General Treatise on various Cold Mineral Waters in England, but more particularly those at.....Neville Holt, etc. 8vo. *London.*

1781.

JONES, W.—Physiological Disquisitions; or, Discourses on Natural Philosophy of the Elements [Figure of Fossil Fish from Barrow, p. 412]. 4to. *London.*

1790.

MARSHALL, W.—The Rural Economy of the Midland Counties, etc. [Soils, etc., vol. i., pp. 6, 26, 28, 188; vol. ii., pp. 2, 87.] Small map. 2 vols. 8vo. *London.*

1794.

MONK, J.—General View of the Agriculture of the County of Leicester. With observations on the means of their Improvement. Drawn up for the consideration of the Board of Agriculture and Internal Improvement. [Soils, etc., p. 8.] pp. 75, Map, etc. 4to. *London.*

1795–1815.

NICHOLS, J.—The History and Antiquities of the County of Leicester. [Soils, minerals, and fossils, vol. ii., pp. 4, 5, 6, 144, 235, 504, 639, 700, 769; vol. iii., pp. 61, 81–84, 90, 133, 134, 143, 298, 402, 439, 614, 615, 659, 687, 739, 895, 981, 1032, 1050, 1123, 1125; vol. iv., 129, 204, 462, 815.] 4 vols. 2 pts. in each. Folio. *London.*

1807.

ANON.—[Account of the finding of the remains of a bull? at Bottesford near Grantham.] *Phil. Mag.*, vol. xxvii., p. 93.

BRITTON, J.—A Topographical and Historical Description of Leicestershire. *Beauties of England and Wales*, vol. ix., p. 313. 8vo. *London.*

PITT, W.—A General View of the Agriculture of the County of Leicester, etc. [Soils, p. 3; Minerals, p. 7; Water supply, p. 10.] 8vo. *London.*

1810.

FAREY, J.—Stratification of England and France. [Gypsum.] *Phil. Mag.*, vol. xxxv., p. 135.

———On the supposed Fresh-water Origin of the Gypsum Strata in the Environs of Paris; on the Geological Characters and Relations of the Alum Shales on the Northern Coasts of Yorkshire; and on the Orbicular Blocks of Sienite on Mount-Sorrel Hill, in Leicestershire. *Phil. Mag.*, vol. xxxv., pp. 256–261.

———A List of about Five Hundred Collieries in and near to Derbyshire. *Ibid.* p. 431.

1811.

FAREY, J.—A List of about 280 Mines of Lead—some with Zinc, Manganese, Copper, Iron, Fluor, Barytes, etc., in and near to Derbyshire. *Ibid.* vol. xxxvii., p. 106.

———A List of about 700 Hills and Eminences in and near to Derbyshire with the Stratum that occupies the top of each, and other Particulars. *Ibid.* pp. 161–175. (Errors at p. 443.)

1812.

BAKEWELL, R.—Reply to Mr. Farey's Geological Observations. *Phil. Mag.*, vol. xl., p. 45.

1812–1846.

SOWERBY, J.; continued by J. DE C. SOWERBY.—The Mineral Conchology of Great Britain. [Leicestershire, vol. i., pp. 33 and 128, 1812; vol. v., p. 64, 1825.] 8vo. *London.*

1813.

FAREY, J.—Observations in Objections to some new Arrangements and Simplifications of the strata of England proposed by Mr. Bakewell.—A Defence of the Reality and Circumstances stated, respecting three great Faults or Dislocations of the Strata in and near Derbyshire.—On Mr. Silverwood's intended Section of all the Derbyshire Strata.—On Mr. Hall's Survey and Models of the high Peak of Derbyshire.—The slate of Charnwood Forest not stratified, etc. *Phil. Mag.*, vol. xlii., pp. 103–116.

PITT, W., and R. PARKINSON.—A General View of the Agriculture of the Counties of Leicester and Rutland drawn up for the consideration of the Board of Agricultural and Internal Improvement, with a Map and Plates. 8vo. *London.*

1815.

SMITH, W.—A Delineation of the Strata of England and Wales, with part of Scotland, etc. [Map of the Strata in fifteen sheets (scale five miles to an inch), accompanied by a "Memoir" of fifty-one quarto pages.] *London.*

1819.

BAKEWELL, R.—An Introduction to Mineralogy; and the Elements of Crystallography. [Leicester Coalfield, 5th Ed., pp. 196–199, etc.] 5th Ed. under different title, 1838. 8vo. *London.*

1821.

SMITH, W.—A New Map of Leicestershire divided into hundreds exhibiting its Roads, Rivers, Parks, etc., by JOHN CAREY, Engraver, 1821. [The above geologically coloured by W. Smith.] *London.*

1822.

CONYBEARE, REV. W. D., and W. PHILLIPS.—Outlines of the Geology of England and Wales. Part i. [Ashby Coalfield, pp. 403–406.] 8vo. *London.*

1823.

BUCKLAND, REV. PROF. W.—Reliquiæ Diluvianæ; or Observations on the Organic Remains contained in Caves, Fissures, and Diluvial Gravel, and on other Geological Phenomena, attesting the action of an Universal Deluge. [Leicester pp. 196, 250. Alludes to gravel at Houghton-on-the-Hill, Hinckley, and Market Harbro'.] 4to. *London.*

PHILLIPS, W.—On the Occurrence of Cleavelandite in certain British Rocks. *Ann. Phil.*, ser. 2, vol. vi., p. 448.

1824.

PHILLIPS, W., and S. LUCK KENT.—Observations on the Rocks of Mount Sorrel, of Charnwood Forest, and of the Neighbourhood of Groby in Leicestershire. *Ibid.* vol. vii., pp. 1–19. One plate.

1827.

YATES, REV. J.—Observations on the Structure of the Border County of Salop and North Wales; and of some detached groups of Transition Rocks in the Midland Counties [p. 263 refers to Enderby and Croft]. *Trans. Geol. Soc.*, ser. 2, vol. ii., pp. 237–264.

1829.

FORSTER, F.—Extract from a Report made on the 29th of September, 1827, on the probability of finding Coal near Leicester. [Drift coal at Birstall. Small map Leicester to Ashby, 5 miles=1 inch.] *Phil. Mag.*, ser. 2, vol. v., pp. 347–350.

1830.

DAUBENY, DR. C.—Memoir on the occurrence of Iodine and Bromine in certain Mineral Waters of South Britain. [Leicester, p. 229.] *Phil. Trans.*, vol. cxx., p. 223.

1833.

CONYBEARE, REV. W. D.—On the alleged Discovery of Coal at Billesdon, Leicestershire. *Phil. Mag.*, ser. 3, vol. iii., p. 112.

HOLDSWORTH, J.—Notice of the Discovery of Coal-Measures and of Fossil Fruits at Billesdon Coplow, in Leicestershire. *Ibid.* p. 76.

1834.

CONYBEARE, REV. W. D.—On the probable future extension of the Coalfields at present worked in England. [Leicester, pp. 346–348.] *Phil. Mag.*, vol. iv., pp. 161 and 346; vol. v., p. 44.

CONYBEARE, REV. W. D.—Inquiry how far the theory of M. Elie de Beaumont concerning the parallelism of Lines of Elevation of the same Geological Æra is agreeable to the phenomena as exhibited in Great Britain. [Charnwood, p. 409.] *Phil. Mag.*, vol. iv., pp. 404–414, concluded from vol. i., p. 126.

HOLDSWORTH, J.—A Notice of some important Geological Discoveries at Billesdon Coplow, Leicestershire, with Observations on the Nature of their Relations to the Modern System of Geology. *Mag. Nat. Hist.*, vol. vii., p. 38.

MAMMATT, E.—A Collection of Geological Facts and Practical Observations, intended to elucidate the formation of the Ashby Coal Field, in the parish of Ashby-de-la-Zouch and the neighbouring district; being the result of forty years' experience and research. [Map and profiles, coloured sections, and 102 plates of fossils. Noticed in *Proc. Geol. Soc.*, vol. ii., pp. 163, 357.] 4to. *Ashby-de-la-Zouch* and *London*.

SEDGWICK, PROF. A.—[Abstract of a paper on the Rocks of Charnwood Forest.] (Cambridge Phil. Soc.). *Phil. Mag.*, ser. 3, vol. iv., pp. 68, 69. See also C. ALLSOP, 1842.

URE, DR. A.—Analysis of Moira Brine Spring, near Ashby-de-la-Zouch, Leicestershire; and Researches on the Extraction of Bromine. *Phil. Trans.*, vol. cxxiv., p. 577.

1837.

ANON.—Abstract of a Paper on the Fossil Ichthyosaurus, from Barrow-on-Soar. *Analyst*, vol. vii., p. 233.

1838.

JUKES, J. B.—A Popular Sketch of the Geology of the County of Leicester. *Analyst*, vol. viii., p. 1.

1842.

ALLSOP, C.—Brief account of the Geological Visit of Professors Sedgwick, Airy, and Whewell to Charnwood Forest. [Written in 1833, but published posthumously in 1842 as an appendix to J. B. Jukes' account of the Geology of Charnwood in POTTER'S History and Antiquities of Charnwood Forest.] 4to. *Nottingham*.

JUKES, J. B., and others.—Appendix on the Geology, Botany, and Ornithology of the District, in POTTER'S "History and Antiquity of Charnwood Forest." 4to. *Nottingham*. [A cheap and popular edition published by Allen, *Nottingham*.] See ANON., 1857.

1843.

MORRIS, J.—A Catalogue of British Fossils, comprising the Genera and Species hitherto described; with references to their geological distribution and to the localities in which they have been found. 2nd Ed. 1854. 8vo. *London*.

1846.

ANON. [W. H. COLEMAN].—Sketch of the Geology of Leicestershire pp. 24–27 of W. WHITE'S History, Gazetteer and Directory of Leicestershire, and the small county of Rutland, together with the adjacent towns of Grantham and Stamford, etc. With a map. 12mo. *Sheffield*. See also 1863.

1849.

M'COY, F.—On the Classification of some British Fossil Crustacea with Notices of New Forms in the University Collection at Cambridge. [*Eryon Barrovensis* from Barrow, pp. 172, 173.] *Ann. Mag. Nat. Hist.*, ser. 2, vol. iv., pp. 161, 330, 392.

1850.

PLANT, JOHN.—Notice of the Discovery of Beds of Keuper Sandstone containing Zoophytes in the Vicinity of Leicester. *Rep. Brit. Assoc.* for 1849, Sections, p. 64.

1853.

TRIMMER, J.—Notes on the Geology of the Keythorpe Estate, and its relations to the Keythorpe System of Drainage. *Journ. Roy. Agric. Soc.*, vol. xiv., pp. 96–105.

1854.

EGERTON, SIR P. DE M. G.—On some new Genera and Species of Fossil Fishes. [*Pycnodus liassicus* from Barrow, p. 436.] *Ann. Mag. Nat. Hist.*, ser. 2, vol. xiii., p. 433.

1855.

EGERTON, P. DE M. G.—*Pycnodus liassicus* from Barrow-on-Soar. *Mem. Geol. Survey*, dec. viii., no. 10, pl. x.

1856.

PLANT, JAMES.—On the Upper Keuper Sandstone (included in the New Red Marls) and its Fossils at Leicester. *Quart. Journ. Geol. Soc.*, vol. xii., p. 369.

1857.

ANON. [J. B. JUKES].—Geology of Charnwood Forest. Pp. i–xxii., plate (sections). Appendix to "An Illustrated Hand Book to Charnwood Forest," by R. ALLEN. 8vo. *Nottingham and London.* Also later editions.

BRODIE, REV. P. B.—Remarks on the Lias of Barrow in Leicestershire compared with the lower part of that Formation in Gloucestershire, Worcestershire, and Warwickshire. *Ann. Mag. Nat. Hist.*, ser. 2, vol. xx., pp. 190–192; and *Proc. Cotteswold Nat. Club*, vol. ii., pp. 139–141. [Republished with but little alteration in 1867.]

FAIRBAIRN, W.—On the Comparative Value of various kinds of Stone, as exhibited by their Powers of Resisting Compression. [Mount Sorrel Granite.] *Mem. Lit. Phil. Soc. Manchester*, ser. 2, vol. xiv., pp. 31–47.

1858.

ANON. [? J. PLANT].—Report of the Geological Section. [Trias.] *Rep. Leicester Lit. Phil. Soc.*, 1858, pp. 17-22.

PLANT, JAMES.—[Letter on the] Geology of Ashby-de-la-Zouch. *Geologist*, vol. i., p. 309.

————.—[Letter on the] Triassic Strata [of Leicestershire]. *Ibid.*, p. 310.

RAMSAY, A. C., H. W. BRISTOW, H. BAUERMANN, and A. GEIKIE. A Descriptive Catalogue of the Rock Specimens in the Museum of Practical Geology, with Explanatory Notices of their Nature and Mode of Occurrence in Place. 2nd Ed., 1859; 3rd Ed., 1862 (pp. 19-21 Charnwood). 8vo. *London.*

1859.

DAVIDSON, T.—A Monograph of the British Fossil Brachiopoda. Part V. The Carboniferous Brachiopoda. [Breedon, pl. ix., p. 64; Ashby, pl. xiv., p. 69, 70.] *Palæontograph. Soc.* 4to. *London.*

HOWELL, H. H. -The Geology of the Warwickshire Coalfield. *Memoirs of the Geological Survey.* 8vo. *London.*

MARSHALL, J. G.—On the Geology of the Lake District in reference especially to the Metamorphic and Igneous Rocks. [Charnwood Forest Granite, p. 93.] *Rep. Brit. Assoc.* for 1858, p. 84.

PLANT, JAMES.—Notice of the Occurrence of Mammalian Remains in the Valley of the Soar, Leicestershire. *Geologist*, vol. ii., p. 174.

————Blocks of Lower Oolite in the Drift-Clay at Leicester. *Ibid.*, p. 176.

1860.

AVELINE, W. T., and H. H. HOWELL.—The Geology of Part of Leicestershire. (Description of Quarter Sheet 63 S.E.) *Memoirs of the Geological Survey.* 8vo. *London.*

HULL, E.—On the Geology of the Leicestershire Coalfield and the Country around Ashby-de-la-Zouch. *Ibid.*

1861.

ANON. (J. H. W.).—On a Skull found in the Valley of the Trent, near Newark. *Geologist*, vol. iv., p. 415.

DRAKE, F.—Human remains found with bones of extinct animals in the Vale of Belvoir. *Ibid.*, p. 246.

DRAKE, F.—Human remains in the drift of the Vale of Belvoir. *Ibid.*, pp. 349-352.

HULL, E.—The Coal Fields of Great Britain; their History, Structure, and Duration. With Notices of the Coal Fields of other Parts of the World. [Leicestershire, 4th Ed., pp. 238-244.] 8vo. *London.* Ed. 2, 1861; Ed. 3, 1873; Ed. 4, 1881.

PLANT, J.—Human remains in the Trent Valley. *Geologist*, vol. iv., p. 495.

1862.

ANON. (T. R. J.).—Fossil Mammalia [in Leicester Museum, found at Keyworth and Leicester Infirmary]. *Geologist*, vol. v., p. 471.

BLAKE, C. C.—On Crania of the most ancient races of men. [p. 215 refers to Leicester]. *Ibid.*, pp. 205-233. Further Notes on Human Skulls from the Heathery Burn Cave, Weardale, Durham; with a Notice of the River-bed Skeleton from Leicester. *Ibid.*, pp. 313-316.

BROWN [E.].—On an Ancient Bed of the River Trent. *Mid. Scientific Assoc.*

FOWLER, GEORGE.—On the Method adopted in working the Main Seam of Coal at Moira, in Leicestershire, particularly with reference to spontaneous combustion. *Trans. N. Inst. Mining Eng.*, vol. x., pp. 161-165, 167-182.

HULL, E.—On Isodiametric Lines as means of representing the Distribution of Sedimentary Clay and Sandy Strata as distinguished from Calcareous Strata, with special reference to the Carboniferous Rocks of Britain. [Leicester, p. 137.] *Quart. Journ. Geol. Soc.*, vol. xviii., p. 127.

HUXLEY, PROF.—Notes upon Human Remains from the Valley of the Trent, and from Heathery Burn Cave, Durham. *Geologist*, vol. v., pp. 201-204.

JONES, PROF. T. R.—A Monograph of the Fossil Estheriæ. [Leicester, pp. 58, 63, 73.] *Palæontograph. Soc.*

MACKIE, S. J.—Human Bones at Leicester [supposed associated with *Bos primigeneus*]. *Atheneum*, Nos. 1810-1835, p. 23.

PLANT, J.—Discovery of a Human Skeleton and other Remains in the bed of the River Soar, at Leicester. *Geologist*, vol. v., p. 260.

1863.

ANSTED, PROF. D. T.—On the Metamorphic origin of the Porphyritic Rocks of Charnwood Forest. *Geologist*, vol. vi., p. 371; Abstract in Rep. Brit. Assoc. for 1863, p. 64.

COLEMAN, REV. W. H.—Geology of Leicestershire. In *W. White's History Gazetteer and Directory of the Counties of Leicester and Rutland.* 2nd ed. pp. 77-111. 8vo. *Sheffield* and *London.*

DRAKE, F.—Mammoth Remains at Leicester. *Geologist*, vol. vi., p. 457.

PLANT, J.—Remains of the Mammoth at Leicester. *Athenæum*, No. 1882, p. 683.

SORBY, H. C.—On the Microscopical Structure of Mount Sorrel Syenite artificially fused and cooled slowly. *Proc. Geol. Soc. W. Riding of Yorkshire*, vol. iv., p. 301; Abstract in *Geol. Mag.*, vol. ii., p. 448, 1865.

1864.

ANON. (W. D.).—The Skin of Reptiles preserved in a Fossil State. [*Ichthyosaurus tenuirostris* from Barrow.] *Geol. Mag.*, vol. i., p. 248.

RAMSAY, PROF. A. C.—The Breaks in Succession of the British Mesozoic Strata. (Presidential Address.) *Quart. Journ. Geol. Soc.*, vol. xx., p. xl.

1865.

ANON. (T. R. J.) [T. RUPERT JONES.].—Sorby on Microscopical Structure of Mount Sorrel Syenite.....[Notice of Sorby, 1863, and Marshall, 1859]. *Geol. Mag.*, vol. ii., p. 448.

ANON. (D. M.).—Geological Anecdote of Mr. George Stephenson [Piercing the igneous rock at Coalville]. *Geol. Mag.*, vol. ii., pp. 528 and 570.

GREEN, A. H.—Letter on finding the igneous rock at Coalville. *Ibid.*, p. 571.

MACKINTOSH, D.—Notes on Charnwood Forest. *Geol. Mag.*, vol. ii., p. 498.

OWEN, PROF. R.—Monograph of the Fossil Reptilia of the Liassic Formations. Part 1. *Palæontograph. Soc.*

PLANT, JAMES.—Are the [Slate] rocks of Charnwood Forest Laurentian? *Geol. Mag.*, vol. ii., p. 233.

1866.

ANSTED, PROF. D. T.—Physical Geography and Geology of the County of Leicester. 4to. *Westminster.* Review and Abstract. *Geol. Mag.*, vol. iv., p. 162. 1867.

FOSTER, C. LE N.—On the Occurrence of Molybdenite in Leicestershire .....*Geol. Mag.*, vol. iii., p. 525.

HOLL, DR. H. B.—On the Pre-Cambrian Rocks of Central England. *Rep. Brit. Assoc. for* 1865, *Sections*, p. 59.

MOSCROP, W. J.—A Report on the Farming of Leicestershire [Account of soils, etc.]. Small geol. map. *Journ. Roy. Agric. Soc.*, ser. 2, vol. ii., pp. 289–337.

STARTIN, A.—On some special deposits of drift in the Parish of Exhall near Coventry, and also a few remarks on the drift of the surrounding district generally. *Proc. Warwickshire Geol. Soc.*, pp. 26-33.

1867.

BRODIE, REV. P. B.—On the Correlation of the Lower Lias at Barrow-on-Soar, in Leicestershire, with the same strata in Warwickshire, Worcestershire, and Gloucestershire; and on the occurrence of the remains of Insects at Barrow in Yorkshire. *Ann. Mag. Nat. Hist.*, ser. iii., vol. xix., p. 31–34; Abstract in *Brit. Assoc. Rep.* for 1866, *Sections*, p. 51; also under different title in *Proc. Warwickshire Field Club*, p. 1, 1868; *Trans. Woolhope Nat. Field Club* for 1866, p. 207, 1867; *Trans. Dudley and Midland Geol. and Sci. Soc.*, 1868.

MURCHISON, SIR R. I.—On the parts of England and Wales in which Coal may and may not be looked for beyond the known Coalfields. *Rep. Brit. Assoc.* for 1866, pp. 57–63.

TIMMINS, REV. J. H.—On the Chemical Geology of the Malvern Hills [contains two analyses of Mount Sorrel trap, p. 364]. *Quart. Journ. Geol. Soc.*, vol. xxiii., p. 352.

1868.

ESKRIGGE, R. A.—Geological Notes made during a Tour in Leicestershire. *Trans. Manchester Geol. Soc.*, vol. vii., pp. 51–57.

HALL, T. M.—The Mineralogist's Directory; or a Guide to the Principal Mineral Localities in the United Kingdom of Great Britain and Ireland. [Minerals from Staunton Harold.] 8vo. *London.*

HULL, E.—Observations on the Relative Ages of the Leading Physical Features and Lines of Elevation of the Carboniferous District of Lancashire and Yorkshire. [Coleorton Fault, p. 331.] *Quart. Journ. Geol. Soc.*, vol. xxiv., pp. 323—335.

LEWIS, G.—On the Coleorton District of the Leicestershire Coal Field. *Trans. S. Wales Inst. Eng.*, vol. v., pp. 33-44.

MAW, G.—The Trias of Charnwood Forest. *Geol. Mag.*, vol. v., pp. 197, 198.

MOTT, F. T.—Charnwood Forest: its .... Natural Curiosities, &c. [Geological Map one mile to an inch. Notes, pp. 11—23.] Ed. 3. 8vo. *London.*

PLANT, JOHN.—Baden Powell and Charnwood Forest. *Geol. Mag.*, vol. v., p. 199.

POWELL, PROF. BADEN.—On the Igneous Rocks of Charnwood Forest and its neighbourhood. *Geol. Mag.*, vol. v., p. 111.

WOODWARD, HY.—Third Report on the Structure and Classification of the Fossil Crustacea. [New Lower Lias Crustacea from Barrow-on-Soar, p. 45.] *Rep. Brit. Assoc.* for 1867, p. 45.

1869.

DRAKE, F.—[Note on human bones found at 16 feet below the surface in a gravel pit at Hinckley, near Leicester.] (Midland Scientific Association.) *Geol. Mag.*, vol. vi., p. 377.

———— Human Remains in the Gravels of Leicestershire. [Tusk of Elephant at Leicester.] (*Rep. Brit. Assoc.* for 1869, p. 130, title only.) *Anthrop. Rev.*, vol. vii., p. 427.

HULL, E.—The Triassic and Permian Rocks of the Midland Counties of England. Memoirs of the Geological Survey. 8vo. *London.*

MOLYNEUX, W.—Burton-on-Trent, its History, its Waters, and its Breweries. [Map of the town with geol. section, also section in Bretby Colliery Railway. Geology, pp. 147-213.] 8vo. *London* and *Burton.*

PLANT, JAMES.—On the so-called Pseudomorphous Crystals of Chloride of Sodium, found in the Upper Triassic rocks of Leicestershire, and the adjoining counties. (Mid. Scientific Assoc.) *Geol. Mag.*, vol. vi., 377.

STARTIN [A.].—[Account of an Excursion to Charnwood.] *Proc. Warwicksh. Field Club*, p. 31.

1870.

ALLPORT, S.—On the Basaltic Rocks of the Midland Coalfields. *Geol. Mag.*, vol. vii., pp. 159–162, 431–435.

ANON.—Short Account of Mountsorrel and the working of its Granite Quarries. [Comparison of weight, specific gravity, etc., with other Charnwood rocks.] 8vo. *Leicester.* Extracted from *The Building News* of July 8 and *The Builder* of November 12, December 10, and December 24, 1870.

HULL, E.—On the extension of the Coalfields beneath the newer formations of England, and the successive stratigraphical changes to which the carboniferous rocks have been subjected. *Rep. Brit. Assoc.* for 1870, Sections, pp. 74, 75. Printed separately under different title. 8vo. *London*, 1870.

LUCY, W. C.—Notes upon the Occurrence of Post-Pliocene Drift of Charnwood Forest. *Geol. Mag.*, vol. vi., p. 497.

MUSGRAVE, R. M.—On the Drift Gravel of Lutterworth, Kilworth, etc. *Proc. Warwickshire Field Club*, pp. 11–23.

WILSON, J. M.—On the Drifts and Gravels and Alluvial Soils of Rugby and its Neighbourhood. *Rep. Rugby School Nat. Hist. Soc.* for 1869, pp. 16–35.

———— On the Surface-deposits in the neighbourhood of Rugby. *Quart. Journ. Geol. Soc.*, vol. xxvi., pp. 192–202.

1871.

REPORTS.—Report of the Commissioners appointed to inquire into the several matters relating to Coal in the United Kingdom. [Leicester. vol. i., pp. 30, 132; vol. ii., pp. 326, etc.; vol. iii., p. 89, Ap. p. 28.] 3 vols. Folio. *London.*

RAMSAY, PROF. A. C.—On the Physical Relations of the New Red Marl, Rhætic Beds, and Lower Lias. *Quart. Journ. Geol. Soc.*, vol. xxvii., pp. 189–199.

1872.

FISHER, O.—On the Phosphatic Nodules of the Cretaceous Rocks of Cambridgeshire. [Erratic pebbles from Charnwood, p. 62.] Abstract, *Quart. Journ. Geol. Soc.*, vol. xxviii., p. 396; in full, vol. xxix., pp. 52–63.

HULL, E.—A Treatise on the Building and Ornamental Stones of Great Britain and Foreign Countries, arranged according to their Geological Distribution and Mineral Character. [Bardon Hill, p. 81; Chellaston, p. 162; Mount Sorel, pp. 37, 60.] 8vo. *London.*

1874.

ALLPORT, S.—On the microscopic structure and composition of British Carboniferous Dolerites. [Coalville]. *Quart. Journ. Geol. Soc.*, vol. xxx., pp. 529–567. Plate.

ANON.—Another Discovery of Coal near Leicester. [Lindridge.] *Coll. Guard.*, vol. xxvii., p. 757.

BRODIE, REV. P. B.—Notes on a Railway section of the Lower Lias and Rhætic between Stratford-on-Avon and Fenny Compton; on the occurrence of the Rhætics near Kineton, and the Insect-beds near Knowle in Warwickshire, and on the Recent Discovery of the Rhætics near Leicester. *Quart. Journ. Geol. Soc.*, vol. xxx., pp. 746–749.

——— The Distribution and Correlation of Fossil Insects, and the supposed occurrence of Lepidoptera and Arachnida in British and Foreign strata, chiefly in the Secondary Rocks. [Insect wings, Barrow.] *Proc. Warwicksh. Field Club*, pp. 12, 16–38.

CROSSKEY, REV. H. W.—First Report of the Committee appointed for the purpose of recording the position, height above the sea, lithological character, size, and origin of the Erratic Blocks of England, Wales, and Ireland, reporting other matters of interest connected with the same, and taking measures for their preservation. [Charnwood Boulders at Hugglescote.] *Rep. Brit. Assoc. for* 1873, p. 190.

IRVING, REV. A.—On the Geology of the Nottingham District [Rhætic at Barrow and Spinney Hills.] *Geol. Mag.*, dec. ii., vol. i., pp. 314–319. In full in *Proc. Geol. Assoc.* 1875, vol. iv., pp. 45-90.

KERR, C. M.—An Excursion of Mr. Wilson's Geological Class to Mount Sorrel. *Rep. Rugby School Nat. Hist. Soc.* for 1873, pp. 7-9.

MANN, E.—Geological Expedition to Atherstone and Nuneaton. *Ibid.*, pp. 19-22.

PLANT, J.—Geology of Leicestershire. [Rhætic, etc.] *Rep. Leicester Lit. Phil. Soc.*, pp. 37–41.

REPORTS.—Sixth Report of the Commissioners appointed in 1868 to enquire into the best means of preventing the pollution of rivers. The Domestic Water Supply of Great Britain. [Bitteswell, pp. 10, 79; Hugglescote, pp. 76, 116, 356; Leicester, p. 46; Thurmaston, p. 403; Whitwick, p. 73.] Folio. *London.*

WOODWARD, H. B.—Rhætic Beds near Newark. [Barrow.] *Geol. Mag.*, dec. ii., vol. i., p. 480.

1875.

BRODIE, REV. P. B.—On the Lower Lias at Eatington and Kineton, and on the Rhætics in that neighbourhood, and their further extension in Leicestershire, Nottinghamshire, Lincolnshire, Yorkshire, and Cumberland. [Rhætics of Spinney Hills, p. 14.] *Proc. Warwicksh. Nat. Hist. Soc.*, pp. 6–17.

CROSSKEY, REV. H. W.—Second Report . . . on Erratic Blocks, etc. [Leicester and Hoby.] *Rep. Brit. Assoc. for* 1874, p. 197.

HUDLESTON, W. H.—Excursion to Charnwood Forest, Leicestershire. *Proc. Geol. Assoc.*, vol. iv., pp. 307–317.

IRVING, REV. A.—(Note on section of Rhætic Beds between Melton Mowbray and Nottingham.) *Quart. Journ. Geol. Soc.*, vol. xxxi., pp. lxxxi., lxxxii.

JUDD, J. W.—The Geology of Rutland, and the parts of Lincoln, Leicester, Northampton, Huntingdon, and Cambridge, included in Sheet 64 of the One Inch Map of the Geological Survey, with an introductory essay on the classification and correlation of the Jurassic Rocks of the Midland Districts of England. *Memoirs of the Geological Survey.* 8vo. *London.*

PLANT, J.—Geology of Leicestershire. [Report on Leicestershire specimens.] *Rep. Leicester Lit. Phil. Soc.*, pp. 42–46.

1875–1889.

WHITAKER, W., AND OTHERS.—The Geological Record for 1874, 1875, 1876, 1877, 1878, 1879, 1880, 1881, 1882, 1883, 1884. 8vo. *London.*

1876.

ANON.—The Ammonite. [Notes on finding Ammonites in the Upper Lias Clay at Glen Magna.] *Spencer's Illustrated Leicester Almanack*, p. 24.

BONNEY, REV. T. G.—The Age of the Rocks of Charnwood Forest. *Nature*, vol. xv., pp. 97 and 137.

BRODIE, REV. P. B.—On the further extension of the Rhætic or Penarth Beds in Warwickshire, Leicestershire, Nottinghamshire, Yorkshire, and Cumberland ; and on the Occurrence of some supposed Remains of a new Labyrinthodont and a new Radiate therein. *Rep. Brit. Assoc. for* 1875, Sections, p. 64 ; *Proc. Warwicksh. Nat. Club*, pp. 1-11.

CROSSKEY, REV. H. W.—Third Report . . . . . on Erratic Blocks [Shakerstone, Normanton, Hoby]. *Rep. Brit. Assoc. for* 1875, p. 88.

DE RANCE, C. E.—First Report of the Committee appointed for the purpose of investigating the Circulation of the Underground Waters in the Permeable Formations of England ; and the Quality and Quantity of the Water supplied to various Towns and Districts from these formations [General, Leicester, Hinckley, Elmsthorpe, Desford, Anstey, Hathern, Chilwell, Humberstone]. *Rep. Brit. Assoc. for* 1875, p. 118.

GREEN, A. H.—The Age of the Rocks of Charnwood Forest. *Nature*, vol. xv., p. 97.

HARRISON, W. J.—On the Occurrence of Rhætic Beds in Leicestershire. *Quart. Journ. Geol. Soc.*, vol. xxxii., pp. 212-218, two woodcuts ; *Rep. Brit. Assoc. for* 1875, Sections, pp. 66, 67 ; also *Trans. Cardiff Nat. Soc.*, vol. viii., pp. 99-106 (1877).

———The Age of the Rocks of Charnwood Forest. *Nature*, vol. xv., p. 97.

———Notes on the Geology of the North Midland Counties. Kelly's Post Office Directory for Notts, Derby, Leicester, and Rutland. 4to. *London.*

———Notes, Bibliography, and Abstracts of several papers relating to the Geology of Leicester. MSS. in Leicestershire Free Library. 4 vols.

HULL, PROF. E.—The Age of the Rocks of Charnwood Forest. *Nature*, vol. xv., pp. 78 and 116.

———A Scheme of Water Supply for Villages, Hamlets, and Country Parishes of the Central and Eastern Counties. *Quart. Journ. Sci.*, n.s., vol. vi., pp. 304-317 ; and *Rep. Brit. Assoc.* for 1875, Sections, pp. 249, 250.

IRVING, REV. A.—The Geology of the Nottingham District. [Leicester, pp. 81 and 83.] *Proc. Geol. Assoc.*, vol. iv., pp. 45-90.

WOODWARD, H. B.—The Geology of England and Wales. A concise account of the Lithological Characters, Leading Fossils, and Economic Products of the Rocks : with notes on the Physical Features of the Country. 8vo. *London.* Ed. 2. 1887.

1877.

ADAMS, W.—On the Penarth or Rhætic Beds of Glamorganshire, Leicestershire, etc. [Contains reprint of Harrison's account of the Rhætic beds, 1876.] *Trans. Cardiff Nat. Soc.*, vol. viii., pp. 96–98.

AVELINE, W. T.—The Magnesian Limestone and New Red Sandstone in the neighbourhood of Nottingham. *Geol. Mag.*, dec. ii., vol. iv., pp. 155, 156, 380.

ETHERIDGE, R.—Report on the probability of finding Coal under the Estate of the Evington Coal Boring Company, Limited, at Evington, near Leicester. Pp. 4. Fol. Privately printed.

HARRISON, JONATHAN.—Notes on the Whitwick Collieries. *Proc. Dudley Geol. Soc.*, vol. iii., pp. 91, 92.

——— The South-East Leicestershire Coalfield and the Geological Formations of the Surrounding District. *Trans. Chesterfield Inst. Eng.*, vol. iv., pp. 319–326, plate xx. (section). Discussion, vol. v., pp. 134–135.

HARRISON, W. J.—The Leicestershire Coalfield. *Proc. Dudley Geol. Soc.*, vol. iii., pp. 84–87.

——— The Geology of Charnwood Forest. *Ibid.* pp. 88–91.

——— On the Rhætic Section at Dunhampstead Cutting, near Droitwich, and its Correlation with the same Strata elsewhere. [Figures, Leicester specimens.] *Ibid.* pp. 115–125. 2 plates (plans, sections, fossils).

HARRISON, W. J.—A Sketch of the Geology of Leicestershire and Rutland. Reprinted from White's History, etc., of the Counties. Pp. 67, 12 photographs. 8vo. *Sheffield.*

——— On the Geology of Leicestershire. *Proc. Geol. Assoc.*, vol. v., pp. 126–136, 2 woodcuts (sections).

——— Excursion to Leicestershire. *Ibid.* pp. 142–148.

——— Practical Geology in the Town of Leicester. [Notes on minerals used in the town.] *Spencer's Illustrated Leicester Almanack*, pp. 32–35.

HILL, REV. E., and [PROF.] T. G. BONNEY.—The Precarboniferous Rocks of Charnwood Forest. Part I. *Quart. Journ. Geol. Soc.*, vol. xxxiii., pp. 754-789; 6 woodcuts.

———The Rocks of Charnwood Forest. *Nature*, vol. xv., p. 470.

HUTCHINSON, REV. T. N.—Geology of Charnwood Forest. *Rep. Rugby School Nat. Hist. Soc.* for 1876, pp. 34-41, pls. i.-iii. Map and rock sections.

PLANT, J.—Report on the Boring for Coal on the Estate, near Evington, Leicestershire, of the Evington Coal Boring Company, Limited. Pp. 3. Fol. May 7. Printed privately.

———The Rocks of Charnwood Forest. *Nature*, vol. xv., p. 548.

WILSON, E.—Short Notice of a new Exposure of Rhætics near Nottingham. [Barnstone.] *Quart. Journ. Geol. Soc.*, vol. xxxiii. Proc. p. 1.

1877-1881.

ADAMS, A. LEITH.—Monograph of the British Fossil Elephants. [Teeth of *Elephas antiquus* from Barrow, p. 6, and *Elephas primigenius* from Kirby, p. 95.] *Palæontograph. Soc.*

1878.

CROSSKEY, REV. H. W.—Fifth Report . . . . on Erratic Blocks, etc. [Loseby, Evington, Thurnby.] *Rep. Brit. Assoc.* for 1877, p. 89.

DE RANCE, C. E.—Third Report . . . . on Circulation of Underground Waters, etc. [General.] *Rep. Brit. Assoc.* for 1877, p. 61.

GRAYSTON, F. A.—The Correlation of the Leicestershire, Warwickshire, South Staffordshire, and Shropshire Coalfields. (*Tamworth Nat. Hist. Soc.*) *Mid. Nat.*, vol. i., p. 112.

HARRISON, W. J.—Digging out a boulder. *Ibid.*, pp. 153-155.

———A Scheme for the Examination of the Glacial Deposits of the Midland Counties of England. *Ibid.*, pp. 242-245. Also *Proc. Dudley Geol. Soc.*, vol. iv., pp. 46-49, 1880.

———On the Study of Local Geology, with Illustrations from Leicestershire [Free Evening Lectures of Science and Art Department]. 8vo. *London.*

———Practical Geology [Alludes to Leicester]. 12mo. *London.*

HILL, REV. E., and PROF. T. G. BONNEY.—On the Precarboniferous Rocks of Charnwood Forest. *Quart. Journ. Geol. Soc.*, vol. xxxiv., pp. 199–239. Pl. x. (map), 2 woodcuts.

Minutes of Evidence taken in shorthand on the case Richardson *v.* The Evington Coal-boring Company, Limited. 8vo. *Leicester.*

MOLYNEUX, WILLIAM.—On the Occurrence of *Aviculopecten* and other Marine Shells in Deposits associated with Seams of Coal containing Salt Water in the Ashby Coalfield. *Rep. Brit. Assoc.* for 1877, Sections p. 73.

MOTT, F. T.—Report of the Geological Section. *Rep. Leicester Lit. Phil. Soc.*, pp. 25–28.

STOKES, A. H.—Economic Geology of Derbyshire. [Leicester Coal Seams, etc.] *Trans. Chesterfield Inst. Eng.*, vol. vi., pls. i., ii.; also 8vo. *London* and *Derby.*

WOODWARD, DR. H.—On a new and undescribed Macrouran Decapod Crustacean from the Lower Lias, Barrow-on-Soar, Leicestershire. [Same as 1868, but figured here.] *Geol. Mag.*, dec. ii., vol. v., pp. 289-291, pl. vii.

1879.

ADAMS, A. LEITH.—Monograph on the British Fossil Elephants. [Mammoth from Kirby Park. Part ii., p. 95, pl. xiii.] *Palæontograph. Soc.*

ALLPORT, S.—On the Diorites of the Warwickshire Coalfield. *Quart. Journ. Geol. Soc.*, vol. xxxv., p. 637.

——— On the Rocks of Brazil Wood, Charnwood Forest. *Geol. Mag.*, dec. ii., vol. vi., p. 481.

——— and W. J. HARRISON.—On the Rocks of Brazil Wood, Charnwood Forest. *Mid. Nat.*, vol. ii., pp. 243-245.

ANON. [M. B. G.].—The Midland Coalfield. *Coll. Guard.*, vol. xxxvii., pp. 141-256.

ANON. [W. J. HARRISON].—The Geology of Leicestershire. (*Leicester Daily Post.*) *Spencer's Illustrated Leicester Almanack*, pp. 15-18.

BONNEY, PROF. T. G.—The Pre-Cambrian Rocks of Great Britain. *Proc. Birmingham Phil. Soc.*, vol. i., pp. 140-159.

CROSSKEY, REV. H. W.—Sixth Report . . . . on Erratic Blocks, etc. [Humberstone, Loseby, Evington, Aylestone, Leicester.] *Rep. Brit. Assoc.* for 1878, p. 190.

DE RANCE, C. E.—Fourth Report of the Committee . . . . on the Circulation of Underground Waters, etc. [General, Ellistown, Ratcliffe, Glen Parva, Leicester, Newtown Unthank.] *Rep. Brit. Assoc.* for 1878, p. 386.

——— Notes on some Triassic Borings. *Trans. Manchester Geol. Soc.*, vol. xv., pp. 90-112.

HARRISON, W. J.—Annual Excursion. *Rep. Leicester Lit. Phil. Soc.*, pp. 17, 18.

——— Garnets in Charnwood Rocks. *Mid. Nat.*, vol. ii., p. 77 ; also *Spencer's Illustrated Leicester Almanack, etc.*, 1880, p. 48.

——— Rambles with a Hammer. [Charnwood.] *Ibid.*, vol. ii., pp. 117-122.

——— ——— Excursion to Charnwood Forest. *Ibid.*, p. 174.

——— Fossiliferous Bunter Pebbles in the Drift. [Countesthorpe] *Ibid.*, p. 283.

PLANT, JAMES.—Report (to the Local Board of Health) on the Water Supply for the Town of Hinckley, Leicestershire, from the Underground Sandstones of the Triassic Formation. Pp. 12. 8vo. *Hinckley.*

1880.

ANON.—Recent Sciences : Geology. *Spencer's Illustrated Almanack, etc.*, for 1880, pp. 29-35. 8vo. *Leicester.*

——— Charnwood Forest : A Gossiping Picnic. *Ibid.*, pp. 35-38.

BONNEY, PROF. T. G.—The older Rocks of Charnwood Forest. [Abstract of a lecture.] *Mid. Nat.*, vol. iii., p. 207.

CLIFFORD, JOHN.—Barrow Limestone : A Geological Gossip. *Spencer's Illustrated Almanack* for 1890, pp. 38, 41.

DE RANCE, C. E.—Fifth Report of the Committee . . . . on the Circulation of Underground Waters, etc. [Hinckley, Oakham.] *Rep. Brit. Assoc.* for 1879, p. 160.

HARRISON, W. J.—The Syenites of South Leicestershire. *Spencer's Illustrated Leicester Almanack*, &c., for 1880, pp. 42-46. 8vo. *Leicester ; Mid. Nat.* vol. vii., pp. 7-11, 41, 42. 1884.

HARRISON, W. J.—A Starfish bed in the Rhætic Formation. *Sci. Gossip*, p. 56.

——— Another Boulder. [Mount Sorrel granite near Ratby.] *Mid. Nat.*, vol. iii., p. 92.

HILL, REV. E., and PROF. T. G. BONNEY.—The Precarboniferous Rocks of Charnwood Forest. Part III. *Quart. Journ. Geol. Soc.*, vol. xxxvi., pp. 337-350; 3 woodcuts.

MACKINTOSH, D.—On the Correlation of the Drift Deposits of the North-west of England with those of the Midland and Eastern Counties. *Ibid.* pp. 178-188; 3 woodcuts.

1881.

BRODIE, REV. P. B.—On certain Quartzite and Sandstone Fossiliferous Pebbles in the Drift in Warwickshire, and their probable Identity, lithologically and zoologically, with the true Lower Silurian Pebbles with similar Fossils in the Trias at Budleigh Salterton, Devonshire. *Quart. Journ. Geol. Soc.*, vol. xxxvii., pp. 430-435.

CALLAWAY, C.—How to work in the Archæan Rocks. [Charnwood, p. 421.] *Geol Mag.*, dec. ii., vol. viii., pp. 348-353; 420-427.

CROSSKEY, REV. H. W.—Eighth report . . . . on Erratic Blocks, &c. [Ayleston, Thurnby, Syston, Market Bosworth, Carlton, Leicester, Countesthorpe, Oadby.] *Rep. Brit. Assoc.* for 1880, p. 111.

DE RANCE, C. E.—Sixth Report of the Committee . . . . on the Circulation of Underground Waters, &c. [Leicester, Fleckney.] *Rep. Brit. Assoc.* for 1880, p. 105.

QUILTER, H. E.—Exposure of the Middle Series of the Bucklandi Beds in Leicestershire. [Fleckney.] *Mid. Nat.*, vol. iv., p. 265; section.

REPORTS.—Report of the Royal Commission on Agriculture. [Leicestershire, vol iii., p. 370.] 3 vols. Folio. *London.*

WOODWARD, C. J.—The Minerals of the Midlands. [Stanton Harold, p. 89.] *Mid. Nat.*, vol. iv., pp. 87-90, 112; vol. v., pp. 11-13, 202-207.

1882.

BERRY, E. E.—Analyses of five Rocks from the Charnwood Forest District. Communicated, with Notes, by PROF. T. G. BONNEY. *Quart. Journ. Geol. Soc.*, vol. xxxviii., pp. 197–199.

CROSSKEY, REV. H. W.—Ninth Report . . . . on Erratic Blocks, etc. [Leicester, Stonghton, Aylestone, Rothley, Humberstone.] *Rep. Brit. Assoc.* for 1881, p. 205.

DE RANCE, C. E.—The Water Supply of England and Wales; its Geology, Underground Circulation, Surface Distribution and Statistics. 8vo. *London.*

HARRISON, W. J.—Geology of the Counties of England and of North and South Wales. (Leicestershire pp. 151–162. 7 woodcuts.) 8vo. *London.*

——— On the Quartzite Pebbles contained in the Drift, and in the Triassic Strata of England, and on their Derivation from an Ancient Land-Barrier in Central England. *Proc. Birmingham Phil. Soc.*

HULL, E.—On the two British Types of the Lower Cambrian Beds, and the Conditions under which they were respectively deposited. *Quart. Journ. Geol. Soc.*, vol. xxxviii., pp. 210–215. 2 woodcuts; and *Rep. Brit. Assoc.* for 1881, pp. 642, 643.

——— Contributions to the Physical History of the British Isles. Illustrated by twenty-seven coloured maps. [Charnwood pp. 13, 60.] 8vo. *London.* Also under different title in *Trans. Roy. Dublin Soc.*, n.s., vol. i., pt. xix., pp. 257–296.

LAPWORTH, C.—On the Discovery of Cambrian Rocks in the neighbourhood of Birmingham. *Proc. Birmingham Phil. Soc.*, vol. iii., pp. 234–238; *Geol. Mag.*, dec. ii., vol. ix., pp. 563–566.

PAUL, J. D.—Report of the Geological Section [Croft quarry, etc.]. *Rep. Leicester Lit. Phil. Soc.*, pp. 23–26.

PLANT, J.—Vestiges of the Ice Age in Leicestershire. *Leicester Mercury*, March 1; Abstract in *Rep. Leicester Lit. Phil. Soc.* pp. 33, 34.

———— The Coal Formation [Statistics, etc.]. *Rep. Leicester Lit. Phil. Soc.*, pp. 295, 296.

WILSON, E.—On the Rhætics of Nottinghamshire. *Rep. Brit. Assoc.* for 1881, pp. 637, 638; *Quart. Journ. Geol. Soc.*, vol. xxxviii., pp. 451–456, cut; *Mid. Nat.*, vol. vi., pp. 193–199.

1883.

ANON. — Geology of Charnwood. *Spencer's Illustrated Leicester Almanack*, pp. 18–22. 8vo. *Leicester.*

CROSSKEY. REV. H. W.—Tenth Report . . . on Erratic Blocks, etc. [Leicester, Aylestone, Thurnby, Hallaton, Loughborough.] *Rep. Brit. Assoc.* for 1882, p. 245.

DE RANCE, C. E.—Eighth Report of the Committee . . . on the Circulation of the Underground Waters, etc. [Croft, Hinckley Wharf.] *Rep. Brit. Assoc.* for 1882, p. 226.

PAUL, J. D.—On a section exposed on the Great Northern Railway near Thurnby and Scraptoft. [List of Lias Fossils.] *Trans. Leicester Lit. Phil. Soc.*, pp. 50, 51.

———— and A. F. ATKINS.—Excursion to Aylestone and Blaby. [List of Boulders.] *Ibid.*, pp. 24, 25.

QUILTER, H. E.—On an exposure of Lower Lias on the Crown Hill in a pit of the Evington Lime Company. *Ibid.* pp. 51, 52.

———— The Diorite of Charnwood Forest. *Mid. Nat.*, vol. vi., pt. 70, pp. 237, 238.

1884.

BRODIE, REV. P. B.—An account of the discovery, by Prof. Lapworth, of Cambrian and pre-Cambrian Rocks in North Warwickshire, formerly supposed to be of Carboniferous Age. *Proc. Warwickshire Nat. Arch. F. Club* for 1883, pp. 13–16.

CROSSKEY, REV. H. W.—Eleventh Report . . . on Erratic Blocks. etc. [Leicester, Kirby Muxloe.] *Rep. Brit. Assoc.* for 1883, p. 141.

DE RANCE, C. E.—Ninth Report of the Committee . . . . on the Circulation of Underground Waters, etc. [Melton.] *Ibid.*, p. 154.

HARRISON, W. J.—The Syenites of South Leicestershire. *Mid. Nat.*, vol. vii., pp. 7–11, 41, 42.

———— Rambles with a Hammer . . . over Charnwood Forest. *Knowledge*, vol. vi., pp. 516–518. [? same as 1879.]

———— Leicestershire Rocks and Scenery. *Trans. Leicester Lit. Phil. Soc.*, p. 362. [Abstract.]

MARRIOTT, J.—The beds exposed in the railway cutting at Slawston Hill. *Trans. Leicester Lit. Phil. Soc.*, pp. 80, 81.

MOORE, C. A.—The Railway Cutting north of Market Harborough Station. *Ibid.*, pp. 82, 83.

PAUL, J. D.—The Cores from a Boring made near Evington. *Ibid.*, pp. 83–86.

PLANT, JAMES.—On the Map of South-east Leicestershire, just issued by the Government Geological Survey. *Ibid.*, p. 327.

QUILTER, H. E.—The Rhætic Beds of the Spinney Hills. *Trans. Leicester Lit. Phil. Soc.*, pp. 8 and 82.

———— The Cutting near Market Harborough Station. *Ibid.*, pp. 86, 87.

QUILTER, H. E.—On a Slaty Conglomerate in the rocks of Charnwood Forest. [Bradgate.] *Mid. Nat.*, vol. vii., pp. 140, 141.

WILSON, E., and H. E. QUILTER.—The Rhætic Section at Wigston, Leicestershire. *Geol. Mag.*, dec. iii., vol. i., pp. 415–418.

In the High Court of Justice, Chancery Division. Burnaby *v.* The Leicester and Evington Lime Company, Limited, 1884, B. No. 620. Particulars and Conditions of Sale of the Leicester and Evington Lime Works, Leicester. [Contains plan of estate and two vertical sections.] Ed. 2. Folio. *London.*

1885.

ANON.—Excursion to Leicester. *Chesterfield Mid. Inst. Eng.*, vol. xiv., p. 177.

————Patent Victoria Stone Works, Groby Quarries, near Leicester. *Ibid.*, p. 190.

————Bardon Hill Quarries, near Leicester. *Ibid.*, p. 197.

BONNEY, PROF. T. G.—On the Archæan Rocks of Great Britain. *Rep. Brit. Assoc.* for 1884, p. 529.

BROWNE, A. J. JUKES.—The Geology of the South-west of Lincolnshire, with parts of Leicestershire and Nottinghamshire. Explanation of Sheet 70. *Geological Survey Memoir.* 8vo. *London.*

EVERARD, J B.—Report on the Water Supply of the Borough of Leicester. [Geological Features, pp. 5–7] 8vo. *Leicester.*

GRESLEY, W. S.—On the Occurrence of Quartzite Boulders in a Coal Seam in Leicestershire. *Geol. Mag.*, dec. iii., vol. ii., pp. 553–555.

———— Some Inaccuracies upon the Geological Survey Maps and Sections of the Leicestershire Coalfield. *Mid. Nat.*, vol. viii., p. 342.

———— On certain Fossiliferous Nodules and Fragments of Hæmatite (sometimes Magnetite) from the (so-called) Permian Breccias of Leicestershire and South Derbyshire. *Quart. Journ. Geol. Soc.*, vol. xli., Proc. p. 109.

HARRISON, J. W.—On the Pre-Carboniferous Floor of the Midlands. *Mid. Nat.*, vol. xiii., pp. 38–40, 69–73, 100–104, 131–135, 163–167, 194–198.

IRVING, A.—Report on Permian and Trias. *Internat. Geol. Congress* (English Committee), pp. 107–120. Ed. 2 in 1888.

MARTIN, R. F.—Mountsorrel Granite Quarries and Works. *Chesterfield Mid. Inst. Eng.*, vol. xiv., p. 199.

MOTT, F. T.—The Geological History of Charnwood Forest. Map 1 mile to an inch. *Chesterfield Mid. Inst. Eng.*, vol. xiv., pp. 213–224, 259–261 ; also 8vo. *London.*

PAUL, J. D.—The Valley of the Soar. *Trans. San. Inst.*, vol. vii.

———— The Drift at the Countesthorpe Brickyard. *Trans. Leicester Lit. Phil. Soc.* for 1885, p. 115.

QUILTER, H. E.—The Rhætie Beds as exposed at Wigston. *Ibid.*, p. 119.

WILSON, E.—The Lias Marlstone of Leicestershire as a souree of Iron. *Mid. Nat.*, vol. viii., pp. 61–66, 94–97, 123–127, 152–158.

WRIGHT, J.—Groby Granite (or Syenite) Quarries near Leicester. *Chesterfield Mid. Inst. Eng.*, vol. xiv., p. 188.

1886.

BATES, E. F., and L. HODGES.—Notes on a recent exposure of the Lower Lias and Rhætics in the Spinney Hills, Leicester. *Trans. Leicester Lit. Phil. Soc.* for 1886, p. 22.

Bragge, G. S.—The Geology of the South Derbyshire and East Leicestershire Coalfields. *Trans. Chesterfield Mid. Inst. Eng.*, vol. xv., pts. iii. and vii., pp. 198–214, 225–235. Supplement in 1887, with two sheets of sections.

Deeley, R. M.—The Pleistocene Succession in the Trent Basin. *Quart. Journ. Geol. Soc.*, vol. xlii., 437-480. Abstract in *Geol. Mag.*, dec. iii., vol. iii., pp. 284–285.

De Rance, C. E.—On the Occurrence of Brine in the Coal Measures, with some remarks on filtration. *Trans. Manchester Geol. Soc.*, vol. xviii., pt. iii., pp. 61–81, 140.

Gresley, W. S.—Note on C. E. De Rance's paper on Brine in the Coal Measures. *Ibid.* pt. vi., p. 140.

——— On the Occurrence of Fossiliferous Hæmatite Nodules in the Permian Breccia of Leicestershire, together with some account of their economic value. *Mid. Nat.*, vol. ix., pp. 1–8, 33–37, 64–69, 92–99. Abstract in *Proc. Geol. Soc.* 1885, p. 109.

Harrison, W. J.—Faults in the Drift (at Kibworth, Leicestershire). *Mid. Nat.*, vol. ix., p. 138.

Lapworth, C.—On the Sequence and Systematic Position of the Cambrian Rocks of Nuneaton. *Geol. Mag.*, dec. iii., vol. iii., pp. 319–322.

Quilter, H. E.—The Lower Lias of Leicestershire. *Ibid.*, pp. 59–65.

Rutley, F.—The Igneous Rocks, etc., of the Neighbourhood of the Warwickshire Coalfield. [Croft, etc.] *Ibid.*, p. 557–565.

Sharman, G.—On the New Species *Olenus Nuneatonensis* and *Obolella granulata*, from the Lower Silurian ("Cambrian," Lapworth), near Nuneaton. *Ibid.*, p. 565.

Strahan, A.—On the Rocks surrounding the Warwickshire Coalfield, and on the base of the Coal Measures. [Borings at Hinckley, Lindridge, etc.] *Ibid.*, pp. 540–557. *Rep. Brit. Assoc.* for 1886, p. 624.

Waller, T. H.—Preliminary Note on the Volcanic and Associated Rocks of the Neighbourhood of Nuneaton. *Ibid.*, pp. 322–325.

1887.

Bonney, Prof. T. G.—Presidential Address (Section C.). [Charnwood, p. 608.] *Rep. Brit. Assoc.* for 1886, p. 601.

Brown, H. T.—A Chapter in the Physical Geography of the Past. [Leicester Coalfield, Charnwood Forest, etc.] Presidential Address. *Trans. Burton-on-Trent Nat. Hist. Arch. Soc.*, vol. i., pp. 37-67.

Crosskey, Rev. H. W.—Fourteenth Report . . . . on Erratic Blocks, etc. [Leicester.] *Rep. Brit. Assoc.* for 1886, p. 223.

——— On the Glacial Phenomena of the Midland District. [Charnwood erratics.] *Rep. Brit. Assoc.* for 1886, pp. 224-226.

Gresley, W. S.—Notes on the Formation of Coal-seams, as suggested by evidence collected chiefly in Leicestershire and South Derbyshire Coalfields. *Quart. Journ. Geol. Soc.*, vol. xliii., pp. 671-674.

Lapworth, C.—On the Geology of the Birmingham District. *Rep. Brit. Assoc.* for 1886, Sections, p. 621.

———The Cambrian Rocks of the Midlands. *Ibid.*, p. 622.

Paul, J. D.—Shearsby, the Cheltenham of Leicestershire. *Trans. Leicester Lit. Phil. Soc.*, ser. 2, pt. iii., pp. 9-12.

Stooke, T. S.—On a Borehole in Leicestershire. [Hinckley Wharf.] *Proc. Inst. Civ. Eng.*, vol. xc., p. 28.

Tuckwell, Rev. W.—On the Glacial Erratics of Leicestershire and Warwickshire. [Dispersion of Mt. Sorrel granite into Warwickshire, etc.] *Rep. Brit. Assoc.* for 1886, Sections, p. 627.

Waller, T. H.—On the Petrology of the Volcanic and associated Rocks of Nuneaton. *Ibid.*, p. 623.

Wilson, E.—British Liassic Gasteropoda. *Geol. Mag.*, dec. iii., vol. iv., pp. 193-202, 258-262.

1888.

Browne, A. J. Jukes.—The Correlation of the Midland Glacial Deposits with those of Lincolnshire. [Reply to Mr. Deeley.] *Geol. Mag.*, dec. iii., vol. v., p. 332.

Browne, M.—Evidences of the Antiquity of Man in Leicestershire. *Trans. Leicester Lit. Phil. Soc.*, vol. i., pt. ix., pp. 7-37.

Dawkins, W. Boyd.—On the Geography of Britain in the Carboniferous Period. *Trans. Manchester Geol. Soc.*, vol. xix., pt. ii., pp. 37-47; under different title, *Rep. Brit. Assoc.* for 1887, Sections, p. 684.

De Rance, C. E.—Thirteenth Report of the Committee . . . . on the Circulation of Underground Waters, etc. [Hinckley.] *Rep. Brit. Assoc.* for 1887, p. 364.

Deeley, R. M.—Correlation of the Lincolnshire Pleistocene Deposits with those of the Midland Counties. *Geol. Mag.*, dec. iii., vol. v., pp. 153-155.

Gresley, W. S.—On the Occurrence of Boulders and Pebbles in the Coal Measures. *Trans. Manchester Geol. Soc.*, vol. xix., pt. xviii., pp. 488-504.

———— The Occurrence of Variegated Coalmeasures, Altered Ironstones, etc., at Swadlincote, Derbyshire. *Geol. Mag.*, dec. iii., vol. v., pp. 115-117.

Lapworth, C.—On the Discovery of the Olenellus Fauna in the Lower Cambrian Rocks of Britain. *Geol. Mag.*, dec. iii., vol. v., pp. 484-487.

Teall, J. J. H.—British Petrography: with special reference to the Igneous Rocks. [Leicestershire, pp. 211, 250, 251, 270, 271, 321, 322, 341, 388.] 4to. *London.*

1888–1890.

Lydekker, R.—Catalogue of the Fossil Reptilia in the British Museum. [Barrow.] 8vo. *London.*

1889.

Brown, H. T.—The Permian Rocks of the Leicestershire Coalfield. *Quart. Journ. Geol. Soc.*, vol xlv., pp. 1-40.

Browne, M.—The Vertebrate Animals of Leicestershire and Rutland. 4to. *Birmingham* and *Leicester.*

———— On a Fossil Fish (*Chrondrosteus*) from Barrow-on-Soar, hitherto recorded only from Lyme Regis. *Trans. Leicester Lit. Phil. Soc.*, vol. ii., p. 17.

Callaway, C.—The Present State of the Archæan Controversy in Britain. *Geol. Mag.*, dec. iii., vol. vi., pp. 319-325.

Quilter, H. E.—The Rhætics of Leicestershire. With Notes on Fossil Fish Remains by A. Smith Woodward. *Trans. Leicester Lit. Phil. Soc.*, vol. i., pt. xi., pp. 14-17.

————. The Life-Zones of the British Lias. *Research*, vol. ii., pp. 97-99.

Reade, T. Mellard.—Physiography of the Lower Trias. *Geol. Mag.*, dec. iii., vol. vi., pp. 549-558. Abstract. *Rep. Brit. Assoc.* for 1889, p. 566.

Wilson, E., and W. D Crick.—The Lias Marlstone of Tilton, Leicestershire. *Geol. Mag.*, dec. iii., vol. vi., pp. 296-305, 337-342.

Woodward, A. S.—On Some Remains of Fossil Fishes from the Rhætic Beds of the Spinney Hills, Leicestershire. *Trans. Leicester Lit. Phil. Soc.*, vol. 1., pt. xi., pp. 18-21.

WOODWARD, A. S.—Note on a species of *Pholidophorus* from the Rhætic paper shales of Wigston. *Ibid.*, pp. 22, 23.

1889—1895.

——— Catalogue of Fossil Fishes in the British Museum (Natural History). [*Dapedius orbis*, from Barrow. Part III., pp. 138, 139.] Part I., 1889. Part II., 1891. Part III., 1895. 8vo. *London.*

1890.

BEASLEY, H. C.—The Life of the English Trias. *Proc. Liverpool Geol. Soc.*, vol. vi., pt. ii., p. 145.

BONNEY, T. G.—Mr. Mellard Reid's Interpretation of the Lower Trias Physiography. *Geol. Mag.*, dec. iii., vol. vii., pp. 52 and 235.

BROWNE, A. J. JUKES.—The Physiography of the Lower Trias. *Ibid.*, p. 220.

BROWNE, M.—A Supplementary Contribution to the History of the Fossil Fishes of the Rhætics of Leicestershire. *Trans. Leicester Lit. Phil. Soc.*, vol. ii., pp. 178, 179.

——— Revision of a genus of Fossil Fishes, *Dapedius*. *Ibid.*, p. 196-202.

——— A Contribution to the History of the Lias and Rhætics in Leicestershire (Abstract). *Ibid.*, p. 147.

DE RANCE, C. E.—Fifteenth Report . . . on the Circulation of Underground Waters, etc. [Leicester, p. 74.] *Rep. Brit. Assoc.* for 1889, p. 71.

GRESLEY, W. S.—Evidence furnished by the Quaternary Glacial-Epoch Morainic Deposits of Pennsylvania, U.S.A., for a similar mode of formation of the Permian Breccias of Leicestershire and South Derbyshire. *Quart. Journ. Geol. Soc.*, vol. xlvi., Proc. p. 114.

HULL, E.—Our Coal Resources. *Trans. Edinburgh Geol. Soc.*, vol. vi., p. 76.

QUILTER, H. E.—[Ammonites collected from the Lower Lias of Barrow-on-Soar by Mr. Montagu Browne.] *Trans. Leicester Lit. Phil. Soc.*, n.s., vol. ii., p. 147.

READE, T. M.—Physiography of the Lower Trias. *Geol. Mag.*, dec. iii., vol. vii., pp. 155-157.

RÜCKER, A. W., and T. E. THORPE.—On the Relation between the Geological Constitution and the Magnetic State of the British Isles. [Melton Mowbray.] *Rep. Brit. Assoc.* for 1889, p. 586. Under different title. *Proc. Roy. Soc.*, vol. xlvii., p. 443, and *Nature*, vol. xli., p. 598.

WOODWARD, A. S.—Notes on some new and little known British Jurassic Fishes. [*Browneichthys ornatus*, from Barrow.] *Rep. Brit. Assoc.* for 1889, p. 585 ; *Geol. Mag.*, dec. iii., vol. vi., p. 455.

——— Notes on some Ganoid Fishes, from the English Lower Lias. [*Undina barroviensis*, from Barrow.] *Ann. Mag. Nat. Hist.*, ser. vi., vol. v., p. 436.

——— and C. D. SHERBORN.—A Catalogue of British Fossil Vertebrata. 8vo. *London.*

1891.

BONNEY, T. G.—Note on a Contact Structure in the Syenite of Bradgate Park. *Quart. Journ. Geol. Soc.*, vol. xlvii., p. 101.

BROWNE, M.—[Note on Lias Fossils from Loseby.] *Trans. Leicester Lit. Phil. Soc.*, vol. ii., p. 349.

——— On the Geology of the Keuper in the vicinity of Leicester. *Trans. Leicester Lit. Phil. Soc.*, vol. ii. [misprinted vol. iii.], p. 385.

Browne, M.—Note upon *Colobodus*, a genus of Mesozoic Fossil Fishes *Geol. Mag.*, dec. iii., vol. viii., pp. 501, 502; *Rep. Brit. Assoc.* for 1891, Sections, p. 644.

De Rance, C. E.—Sixteenth Report. . . . on the Circulation of Underground Waters. [Trent Valley, Castle Donington, Moira.] *Rep. Brit. Assoc.* for 1890, p. 352.

Hill, E., and T. G. Bonney.—On the North-west Region of Charnwood Forest, with other Notes. *Quart. Journ. Geol. Soc.*, vol. xlii., pp. 78–100.

Jeffs, O. W.—Report of the Committee. . . . to arrange for the Collection, Preservation, and Systematic Registration of Photographs of Geological Interest in the United Kingdom. [Leicestershire, Nos. 29, 28, p. 435.] *Rep. Brit. Assoc.* for 1890, pp. 429–444.

Mills, M. H.—A few Notes on the Ironstone Deposits of Leicestershire. *Proc. Chesterfield Mid. C. Inst., Eng.*, vol. xviii., p. 64; also *Trans. Fed. Inst. M. Eng.*, vol. ii. (1890–1891), pp. 28–30. Discussion, p. 525 (1892).

Paul, J. D.—Recent Geological Notes. [Beaumont Leys Farm, Minerals, Boring in Leicester.] *Trans. Leicester Lit. Phil. Soc.*, vol. ii., p. 405.

Rücker, A. W., and T. E. Thorpe.—A Magnetic Survey of the British Isles for the Epoch of Jan. 1, 1886. *Phil. Trans.*, vol. xlix., B. pp. 53–328, pls. i.–xiv.

Woodward, A. S., and C. D. Sherborn.—A Catalogue of British Fossil Vertebrata. Supplement for 1890. [Leicester species, pp. 27 and 31.] *Geol. Mag.*, dec. iii., vol viii., pp. 25–34.

1891–1894.

Blake, J. F.—Annals of British Geology for 1890, 1891, 1892, 1893. 8vo. *London.*

1892.

Anon. (M. E.).—General Notes on the Yorkshire, Leicestershire, and Warwickshire Coal Fields. *Coll. Guard.*, lxiv., p. 144.

Beasley, H. C.—The Life of the English Trias (Presidential Address). *Proc. Liverpool Geol. Soc.*, vol. vi., pp. 145–165.

Blake, J. F.—Excursion to Nottingham. [Breedon and Chellaston.] *Proc. Geol. Assoc.*, vol. xii., pp. 386–392.

Bonney, T. G.—On specimens from the Permian Breccia of Leicestershire, collected by W. S. Gresley. *Mid. Nat.*, vol. xv., pp. 25–35, 49–57, pls. ii., iii.

Browne, M.—Notes upon the Mesozoic Fossil Fish (*Ceratodus*), and its living representative, *Epiceratodus* (*Ceratodus*) *Forsteri* (Teller), with exhibition of palatal and mandibular teeth, from the Rhætics of Aust Cliff, Gloucestershire, and Spinney Hills, Leicestershire. *Trans. Leicester Lit. Phil. Soc.*, vol. ii., p. 559.

Gresley, W. S.—A typical section, taken in detail, of the "Main Coal" of the Moira, or Western Division of the Leicestershire and South Derbyshire Coal Field. *Trans. Manchester Geol. Soc.*, vol. xxi., pp. 520–535, with two plates. Discussion, pp. 551–563. Reply to discussion, vol. xxii., pt. iii., pp. 74–85.

———— Geological History of the Rawdon and the Boothorpe Faults in the Leicestershire Coal Field. 8vo. *Newcastle.* Also *Trans. Chesterfield Inst. Eng.*, vol. xix., pl. iv., 1893; and *Trans. Fed. Inst. M. Eng.*, vol. iv., pp. 431–436, pl. xx., 1893. Discussion, vol. vi., pp. 402, 403. 1894.

Hatch, F. H.—Text Book of Petrology. [Analysis of Markfield Diorite, p. 147.] 8vo. *London.*

HUDLESTON, W. H., and E. WILSON.—A Catalogue of British Jurassic Gasteropoda. 8vo. *London.*

WOODWARD, H.—On a Neuropterous Insect from the Lower Lias, Barrow-on-Soar, Leicestershire. *Geol. Mag.*, dec. iii., vol. ix., p. 193–198 pl. v.

1893.

BONNEY, T. G.—On the relation of the Bunter Pebbles of the English Midlands to those of the Old Red Sandstone Conglomerate of Scotland. *Rep. Brit. Assoc.* for 1892, p. 719.

BROWNE, M.—A Contribution to the History of the Geology of the Borough of Leicester. *Trans. Leicester Lit. Phil. Soc.*, vol. iii., pp. 123-240. Five plates.

DEELEY, R. M.—The Glacial Succession. *Geol. Mag.*, dec. iii., vol. x., p. 31.

DE RANCE, C. E.—On the relation of geology to the population and agriculture of England and Wales. [Statistics, etc.] *Trans. Manchester Geol. Soc.*, vol. xxii., pt. iii., pp. 85-112.

EVERARD, J. B.—Coalville Water Supply. 8vo. *Leicester.*

HODSON, G.—A consideration of some of the conditions requisite for obtaining underground water supplies; illustrated by a description of the works for supplying Long Eaton and Melbourne (Derbyshire), and Castle Donington (Leicestershire). *Assoc. of Municipal and County Eng.*, vol. xix.

HULL, E.—On the Discovery of a concealed ridge of pre-Carboniferous rocks under the Trias of Netherseal, Leicestershire. *Geol. Mag.*, dec. iii., vol. x., pp. 552, 553. *Rep. Brit. Assoc.* for 1893, p. 745, 746. *Trans. Fed. Inst. M. Eng.*, vol. viii., pp. 90-92, 1894.

PAUL, J. D.—Boring at Knighton [Wheatsheaf] Co-operative Shoe Works. *Trans. Leicester Lit. Phil. Soc.*, vol. iii., pp. 105, 106.

——— St. John's Stone. *Ibid.*, p. 263.

WOODWARD, H. B.—The Jurassic Rocks of Britain, vol. iii. The Lias of England and Wales (Yorkshire excepted). [Leicestershire pp. 23, 166–174, 231–239, 280–283, 290–293, 305.] *Memoirs of the Geological Survey.* 8vo. *London.*

1894.

BONNEY, T. G.—A Comparison of the Pebbles in the Trias of Budleigh Salterton and of Cannock Chase. *Rep. Brit. Assoc.* for 1893, p. 655.

BROWNE, M.—On some Vertebrate Remains not hitherto recorded from the Rhætic Beds of Britain. [Teeth of *Termatosaurus crocodilinus*, Quenst.] *Rep. Brit. Assoc.* for 1893, pp. 748, 749.

LEWIS, H. CARVILL.—Papers and Notes on the Glacial Geology of Great Britain and Ireland. Edited from his unpublished MSS., with an Introduction by H. W. CROSSKEY. 8vo. *London.*

METCALFE, A. T.—On the Gypsum Deposits of Nottinghamshire and Derbyshire. *Rep. Brit. Assoc.* for 1893, p. 760. Abstract in *Quart. Journ. Geol. Soc.*, vol. lii., p. 461 (1896).

WOODWARD, H. B.—The Jurassic Rocks of Britain, vol. iv. The Lower Oolitic Rocks of England (Yorkshire excepted). [Leicestershire, pp. 28, 180, 496.] *Memoirs of the Geological Survey.* 8vo. *London.*

1895.

BONNEY, T. G.—Supplementary note on the Narborough district (Leicestershire). *Quart. Journ. Geol. Soc.*, vol. li., pp. 24-34.

——— A Comparison of the Pebbles in the Trias of Budleigh Salterton and of Cannock Chase. *Geol. Mag.*, dec. iv., vol. ii., pp. 75-79. *Rep. Brit. Assoc.* for 1894, p. 655.

Browne, M.—On an exposure of Glacial beds in a cutting, for the M. S. and L. Railway, at Birstall Hill. *Trans. Leicester Lit. Phil. Soc.*, vol. iv., p. 25.

——— On a recent exposure of Rhætic and Lias beds on the M. S. and L. Railway, at East Leake. [Also on cemented gravel at Aylestone.] *Ibid.*, pp. 27, 28, 52.

Callaway, C.—Professor Hull and the Cambrian age of the Charnwood Clastics. *Geol. Mag.*, dec. iv., vol. ii., pp. 142, 143.

Gresley, W. S.—Ice-plough Furrows of a Glacial Period. Abstract. *Quart. Journ. Geol. Soc.*, vol. li., p. 494.

Harrison, W. J.—Bibliography of Midland Glaciology. *Proc. Birmingham Nat. Hist. Soc.*, vol. ix., pt. ii., and 8vo. *Birmingham.*

Hull, E.—Geologieal age of the Rocks of Charnwood Forest. *Geol. Mag.*, dec. iv., vol. ii., p. 92.

——— The Leicestershire Coalfield. *Coll. Guard.*, vol. lxix., p. 272.

Jeffs, O. W.—Fifth Report of the Committee on . . . Photographs of Geological Interest, etc. [Leicestershire, Nos. 927-957, p. 278.] *Rep. Brit. Assoc.* for 1894, pp. 274-283.

Paul, J. D.—Cutting at the Swithland Reservoir. *Trans. Leicester Lit. Phil. Soc.*, vol. iv., p. 10.

——— Note on a Glacial Block recently exposed on the eastern side of King Richard's Road. [Leicester.] *Ibid.*, p. 27.

Randall, J.—The Midland Coalfields and superimposed rocks. *Coll Guard.*, vol. lxx., pp. 652, 782.

Watts, W. W.—Notes on some Specimens collected in the Trench, Brazil Wood, Charnwood Forest. *Trans. Leicester Lit. Phil. Soc.*, vol. iv., p. 12.

Woodward, H. B.—The Jurassic Rocks of Britain, vol. v. The Middle and Upper Oolitic Rocks of England (Yorkshire excepted). [Bibliography with many Leicestershire titles.] *Memoirs of the Geological Survey.* 8vo. *London.*

1896.

Anon.—The boring at Ruddington [Notice of excursion]. *Coll. Guard.*, vol. lxxii., pp. 823 and 1111.

Anon.—The Leicestershire Coalfield. [Ibstock, South Leicestershire and Whitwick Collieries.] *Ibid.*, pp. 538, 584, 631.

Anon. (M. E.).—The Warwickshire Coalfield, VI. Baddesley Colliery. *Ibid.*, p. 393.

Bemrose, H. H. Arnold, and R. M. Deeley.—Discovery of Mammalian Remains in the Old River Gravels of the Derwent near Derby. *Quart. Journ. Geol. Soc.*, vol. lii., pp. 497-510.

Browne, M.—Preliminary Notice of an Exposure of Rhætic Beds, near East Leake, Nottinghamshire. *Rep Brit. Assoc.* for 1895, p. 688.

Coke, G. E.—Southern Limit of the Nottinghamshire Coalfield. (Map 1 inch to 3 miles.) *Trans. Fed. Inst. M. Eng.*, vol. xi., p. 339. *Coll. Guard.*, vol. lxxi., p. 1111.

———. J. W. Carr and W. W. Watts. Excursion to Nottingham and Leicester. *Proc. Geol. Assoc.*, vol. xiv., pp. 430-433.

Gresley, W. S.—Remarks on some interesting Coal-Measure sections in the Leieestershire and South Derbyshire Coalfield. *Trans. Manchester Geol. Soc.*, vol. xxv.

Hull, E.—The Eastern Limits of the Midland Coalfield. *Trans. Fed. Inst. M. Eng.*, vol. xi., p. 9.

Lapworth, C., and W. W. Watts.—[Note on the *Olenellus* zone of Nuneaton.] *Quart. Journ. Geol. Soc.*, vol. lii., Proc. p. vi.

TUCKER, W. T.—Archæological and Geological "Finds" of the M. S. & L. Railway. [Mammoth, &c., at Loughborough.] *Nottingham Daily Guardian*, Feb. 17, 1896.

WATTS, W. W.—Notes on the Ancient Rocks of Charnwood Forest. *Geol. Mag.*, dec. iv., vol iii., pp. 485-487; *Rep. Brit. Assoc.* for 1896, pp. 795-797.

1897.

ANON.—Diorites of Atherstone and Nuneaton. *Coll. Guard.*, vol. lxxiii., p. 688.

BINNS, G. J., and G. HARROW.—On the occurrence of certain minerals at Netherseal Colliery, Leicestershire. *Coll. Guard.*, vol. lxxiii., p. 674. *Trans. Fed. Inst. M. Eng.*, vol. xiii., p. 252.

BINNS, G. J., C. FOX-STRANGWAYS, and W. W. WATTS.—Notes on borings at Netherseal, Ashby-de-la-Zouch, Leicestershire. *Ibid.*, pp. 595-598, 599, and vol. xv., p. 209.

BROWNE, M.—Fifth Contribution to Rhætic Literature. The Rhætic Bone-bed of Aust Cliff, and the Rock-bed above it. *Rep. Brit. Assoc.* for 1896, pp. 804, 805.

GEIKIE, SIR A.—Annual Report of the Geological Survey of the United Kingdom. 8vo. *London.*

——— The Ancient Volcanoes of Great Britain. 8vo. *London.*

JEFFS, O. W., and W. W. WATTS.—Report. . . . on Photographs of Geological Interest, etc. [Leicestershire, Nos. 1262-1310, pp. 361-362.] *Rep. Brit. Assoc.* for 1896, pp. 357-365.

WOODWARD, H. B.—The Chalky Boulder-clay and the Glacial Phenomena of the Western-Midland Counties of England. *Geol. Mag.*, dec. iv., vol. ix., pp. 485-497. *Rep. Brit. Assoc.* for 1897, p. 649.

1898.

ANON.—The Warwickshire Coalfield. *Coll. Guard.*, vol. lxxv., p. 747.

ANON. (M. E.).—The Leicestershire coalfield. VII. Bretby Colliery. *Coll. Guard.*, vol. lxxvi., p. 829.

ANON.—The Leicestershire Coalfield. [General account of strata.] *Ibid.*, p. 1154.

GEIKIE, SIR A.—Summary of Progress of the Geological Survey of the United Kingdom for 1897. 8vo. *London.*

GRESLEY, W. S.—Clay veins vertically intersecting Coal-measures. [Sections at Netherseal, Donisthorpe and Rawdon.] *Bull. Geol. Soc. America*, vol. ix., pp. 35-58.

——— Cone-in-Cone: Additional Facts from Various Countries. [Examples from Ashby said to be formed subsequently to the deposition of the Permian.] *Quart. Journ. Geol. Soc.*, vol. liv., p. 196. *Geol. Mag.*, dec. iv., vol. v., p. 236.

HARRISON, W. J.—The Ancient Glaciers of the Midland Counties of England. *Proc. Geol. Assoc.*, vol. xv., pp. 400-408.

LAPWORTH, PROF. C.—A Sketch of the Geology of the Birmingham District. *Proc. Geol. Assoc.*, vol. xv., pp 313-416.

SHRUBSOLE, G. A.—On some High-level Gravels in Berkshire and Oxfordshire. [Analysis of gravel at Repton, p. 594.] *Quart. Journ. Geol. Soc.*, vol. liv., p. 585.

WATTS, PROF. W. W.—Notes on the Petrology of the Birmingham District. *Proc. Geol. Assoc.*, vol. xv., pp. 389-400.

——— Report on the long excursion to the Birmingham District. *Ibid.*, pp. 417-428.

——— Report . . . . . on Photographs of Geological Interest, etc. [Leicestershire, Nos. 1419, 1617-1622.] *Rep. Brit. Assoc.* for 1897, pp. 298-332.

——— Geology for Beginners. 8vo. *London.*

1899.

ANON (M. E).—The Leicestershire Coalfield; viii., Nailstone Colliery; ix., Moira Collieries. *Coll. Guard.*, vol. lxxvii., pp. 58, 106.

ANON.—The Silurian and Carboniferous Rocks of the Midlands. *Ibid.*, p. 264.

ANON.—Excursion to the Cadley Hill Coal-pit and Church Gresley. *Trans. Leicester Lit. Phil. Soc.*, vol. v., p. 308.

BENNETT, DR. F. W.—[Charnwood Forest.] *Ibid.*, pp. 195–197.

GEIKIE, SIR A.—Summary of Progress of the Geological Survey of the United Kingdom for 1898. 8vo. *London.*

STRANGWAYS, C. FOX.—Excursions to Burrough-on-the-Hill; Melbourne and Repton; Swadlincote, Ticknall, and Melbourne; and Nuneaton and Atherstone. *Trans. Leicester Lit. Phil. Soc.*, vol. v., pp. 239, 241, 303, 307.

WATTS, PROF. W. W.—Report. . . . on Photographs of Geological Interests, etc. [Leicestershire, Nos. 1840, 1841.] *Rep. Brit. Assoc.* for 1898, pp. 530–546.

——— Note on the surface of the Mount Sorrel Granite. *Geol. Mag.*, dec. iv., vol. vi., p. 508.

——— – Excursion to Charnwood Forest. *Trans. Leicester Lit. Phil. Soc.*, vol. v., p. 309.

1900.

BONNEY, T. G.—The Bunter Pebble-beds of the Midlands and the Source of their Materials. *Quart. Journ. Geol. Soc.*, vol. lvi., pp, 287–306.

GEIKIE, SIR A.—Summary of Progress of the Geological Survey of the United Kingdom for 1899. 8vo. *London.*

HALL, W. J.—[Note on a landship at Leire, Leicestershire.] *Trans. Leicester Lit. Phil. Soc.*, vol. v., p. 372.

PAUL, J. D.—The Valley of the Soar. *Ibid.*, p. 426.

STRANGWAYS, C. FOX.—Excursions to Atherstone and Polesworth; Ashby-de-la-Zouch and Melbourne; and Ashby-de-la-Zouch and Measham. *Ibid.*, pp. 477–483.

WATTS, PROF. W. W.—Report . . . . on Photographs of Geological Interest, etc. [Leicestershire Nos. 2284, 2285. Furrowing and smoothing of Granite.] *Rep. Brit. Assoc.* for 1899, pp. 377–397.

——— Note on the Surface of the Mount Sorrel Granite. *Ibid.*, p. 747.

INDEX.

N.B.—Names of Persons (authors, observers, and informants) are in small capitals.

G.

H.

I.

J.

K.

L.

M.

N.

O.

P.

R.

S.

T.

U.

V.

W.

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